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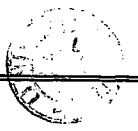
James William Helenus Trail: A British Naturalist In Nineteenth-Century Amazonia

by

Magali Romero Sá

A Dissertation Submitted for the Degree of Doctor of Philosophy, Department of Philosophy, University of Durham, United Kingdom

1996



14 JAN 1997

JAMES WILLIAM HELENUS TRAIL: A BRITISH NATURALIST IN NINETEENTH -CENTURY AMAZONIA

by Magali Romero Sá

ABSTRACT

In 1873, the British naturalist James William Helenus Trail (1851-1919) participated in the first authorized foreign commercial expedition to the Brazilian Amazon region. The exploratory mission was promoted by the "Amazon Steam Navigation Company", a British company which intended to exploit its lands in the valley of the Amazon River. Trail was commissioned to evaluate the potential of the area for timber exploitation, and to indicate additional profitable natural resources.

Trail spent 17 months surveying the Amazon River and tributaries, having explored an area which extends westwards from the city of Belém to the Brazilian border with Peru. The effective logistic support provided by the Company allowed him to collect botanical and zoological material in areas not visited before by other naturalists. Trail's collections, particularly those of plants and insects, were much praised by the various specialists who studied them and who, as a tribute to Trail, named 34 new taxa after him.

When in Amazonia, Trail met the Brazilian botanist Barbosa Rodrigues, who called his attention to the diversity of Amazonian palms. Inspired by Rodrigues, Trail developed a keen interest in palm taxonomy, having described 20 new species from the copious material he collected in the region. Trail's new taxa, however, generated protests from Barbosa Rodrigues, who claimed for himself the authorship of some of the species.

Trail's trip to Amazonia boosted his career in natural history, and established early in his life his reputation among the British scientific community. His Amazonian collections - which include, among others groups, nearly 1,800 plant and 2,100 insect species -, together with his field observations, represent a most relevant, though largely overlooked, contribution to the historical process of the knowledge of the natural history of the region.

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Mr Guilherme Nunan, to whom this work is dedicated.

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At last on the 11th March the S.S. *Maranhense* arrived from Ceará to Liverpool, my passage was taken, my things were sent on board and about 9 pm. I went on board... and so ended my work in Amazonia, and experiences in which I met with much kindness and of which I shall long retain pleasant recollections.

James William Helenus Trail

From the diary of his Amazonian voyage, 1873-75.

CHAPTER 1. INTRODUCTION

1.1. Introductory remarks and objectives

In a lecture on the British naturalists who visited Brazil, given in 1939 at the "Sociedade Brasileira de Cultura Inglesa" in Rio de Janeiro, the Brazilian scientist Bertha Lutz[1] referred, among others, to - "Professor Trail, who made an extensive survey of the Amazon and most of its tributaries including the adjacent lagoons [sic] and serras, at the invitation of the Amazon Steam Navigation Company (1873-74)" (Lutz, 1941: 7).

Lutz's allusion to Trail, however, is a rare occurrence, since she is one of the few authors who has included the British naturalist among those who explored Brazil during the nineteenth century.[2] Invariably, only the most eminent, such as Burchell, Darwin, Bates, Wallace and Spruce are traditionally cited.

James William HelenusTrail (Plate I), this forgotten personage of the history of the natural history of Brazil, spent nearly 18 months collecting botanical and zoological material during a survey work in Brazilian Amazonia. He arrived in the region in 1873 as a member of the first foreign commercial expedition authorized to enter the Brazilian Amazon region, which was that of the British "Amazon Steam Navigation Company". The scientific works which originated from the study of Trail's collections contributed significantly to the knowledge of the botany and zoology of the Amazon region.

JAMES WILLIAM HELENUS TRAIL
1903

Plate I.

James William Helenus Trail (1851-1919), in his mellow age. From a photo in his Memorial Volume.

The exploration of the Amazon region is a theme that has been exhaustively discussed throughout the years (Stone, 1986; Ure, 1986; Smith, 1990; Souza, 1994). As stressed by Dickenson (1991: 426), however, "in recent years Amazonia has generated much heat and less light". Indeed, the great majority of recent works on the subject has relied exclusively on secondary sources, with their contents being limited to mere synthesis and discussions of published data.

The aim of the present study is to reveal, through the analysis of primary sources, the relevant contribution of the naturalist James H. Trail to the knowledge of the natural history of Amazonia, for which he undoubtedly deserves recognition. His overlooked scientific legacy fully justifies the inclusion of his name among those who have been traditionally associated with the history of the scientific exploration of that region. In addition, the work illustrates the intrinsic relationship between science and imperialism which characterised natural history explorations during the nineteenth century. Such link is perceptible in the objectives of the expedition of the Amazon Steam Navigation Company, and in Trail's assignements to fulfil interests of the metropolis.

1.2. Development of the theme

The 1873-75 expedition of the Amazon Steam Navigation Company, in which J.W.H. Trail participated, was motivated by the political and economic changes which had been occurring in the Brazilian portion of the Amazon region since the beginning of the nineteenth century. To properly analyze the performance of the British naturalist J.

W. H. Trail in late nineteenth-century Amazonia, one should, as stressed by Knight (1987a: 7):

"bring context into focus, if not into the foreground".

Knight also emphasizes in the same work that the

"historian of science must be aware of the sociological as well as the historical, philosophical and scientific aspects of the story".

Following the above approach, the political, economic and social transformations which took place in nineteenth-century Amazonia are reviewed in Chapter 2 to disclose the circumstances which motivated Trail's trip to Brazil. Pertinent events of that epoch were: the opening of the Brazilian portion of Amazonia to foreign enterprises after centuries of restrictions; the formation of a foreign navigation company to operate in Amazonia with full support from the Brazilian Government (see Appendix I); and the official permission to a commercial expedition to explore the region.

The above changes were the main forces behind Trail's achievements in Amazonia, especially regarding the mileage and area covered (15,000 miles in just 17 months, and an explored area stretching from the mouth of the Amazon to the Peruvian border), and the geographical range of the scientific collections obtained. Trail's activities in Amazonia are reviewed in Chapter 3 by means of an analysis of his unpublished diary.

As a true naturalist (as shown in the biography included in Chapter 3), Trail did not miss the opportunity of putting together a prime scientific collection in a region with

such infinite variety of botanical and zoological species such as Amazonia. Apart from specimens he intended to present to a few personal acquaintances, most of his botanical material was destined for the Royal Botanic Gardens, Kew. Still in the beginning of his career in natural history, Trail perceived the unique occasion before him to secure recognition among the British scientific community by means of his collection of Amazonian plants (see Appendix II for a list of the vascular plant specimens collected by Trail in Amazonia). To reach his objectives, Trail obtained support from no less than the eminent director of the Royal Botanic Gardens, Kew - Sir Joseph Hooker. As a customary practice, young botanists usually sought patronage from Kew's staff to get posts overseas or even appointments at home. Such practice started when the royal garden was still private and under the care of Sir Joseph Banks (see Desmond, 1994), having later become widespread when Kew was transformed into a public institution under the direction of Sir William Hooker (later succeeded by his son, Sir Joseph Hooker) (see Brockway, 1979). Lucas (1988) has well illustrated such kind of patronage with Baron von Mueller, who was first a protégé of Sir William Hooker and had later his patronage transferred to W. Hooker's son, Sir Joseph Hooker.

Details included in Trail's unpublished travel diary and correspondence (analyzed in Chapter 4) reveals the cordial relationship which developed between him and Dr. J. Hooker, and the economic interests behind Hooker's requests. Trail's correspondence pertinent to his Amazonian voyage is transcribed in Appendix III.

As shown in Chapter 4, Trail's scientific collections, and the studies based upon them, conferred on him the credibility and respectability he sought for among the British scientific community. It should be noted that such fast-built reputations were not at all

unusual in nineteenth-century Britain for those who travelled abroad, as commented by Knight (1991: 49):

"Right through the nineteenth century reputations were made on scientific voyages, and important posts might follow".

Browne (1996: 310) also called attention to the link between traveller-collectors and scientific expertise, having stressed that:

"Many such government-sponsored travellers, particularly those associated with the British army or navy, were consequently recognized as 'experts' upon their return - if not in modern terms, at least in the eyes of their contemporaries. To accompany a voyage of exploration provided an opportunity for becoming an authority on a particular group of organisms".

A typical case of "cultural imperialism" involved Trail and a Brazilian botanist, João Barbosa Rodrigues. It developed from a dispute which started during their field work in Amazonia, and resulted later in a discussion about scientific priority, as shown in Chapter 5. The imperialistic views manifested by Trail regarding Rodrigues, which is revealed through his unpublished letters to Sir J. Hooker (transcribed in Appendix III), is in consonance with the typical attitude of presumed superiority adopted by scientists of the culturally developed centres in relation to those of colonies and ex-colonies (see, among others, Reingold and Rothenberg, 1987; Pyenson, 1985b; and Lafuente and Sala, 1989). Rudwick (1985) and Knight (1991), by the way, have shown that such behaviour was also widespread in nineteenth-century Britain, where scientists of the cultural centres (i.e. London, and Oxford and Cambridge as extensions of London) discriminated against those of the provinces.

In summary, the work records the activities of the British naturalist J.W.H. Trail in Brazilian Amazonia, which is accomplished through the information contained in his unpublished manuscripts. It also reviews his contributions to the knowledge of the fauna and flora of the region, both directly through his studies on palms, and indirectly through the collections he took to Britain. Trail's work was analysed within the context of the epoch, to which factors such as his professional ambitions and the interests of the Royal Botanic Gardens were considered determinants.

1.3. Cultural imperialism and colonial science: an overview of recent discussions

Investigations on the scientific exploration of colonies in the eighteenth and nineteenth centuries should be examined in the perspective of recent discussions by historians of science on the themes "cultural imperialism" or "scientific colonialism". In 1990, a colloquium for discussing the subject "Science and empires - a comparative history of scientific exchanges: European expansion and scientific development in Asian, African, American and Oceanian countries", was held in Paris through the initiative of a group of scholars from REHSEIS.[3] The purpose of that meeting was to broaden the scope of earlier discussions started at two previous seminars dedicated to the theme "Science and Empire": one held in Melbourne, Australia, in 1978, for comparing the implantation of science in the United States,

Canada and Australia; and the other held in New Delhi, in 1985, focusing on British ex-colonies[4].

The growing interest on the theme "scientific colonialism" has led to the formulation of models for describing the spread of western science, the ways it has developed in colonies and ex-colonies, and the underrating of colonial science, and peripheral scientists, by those of the cultural centres of the epoch. Discussions on these subjects grew more intense after the publication, in 1967, of a paper from the American scholar George Basalla entitled "*The spread of western science*". In it, Basalla proposed a model for characterizing the diffusion of western science from its place of origin, i.e. Europe, to the rest of the world.

Basalla's model distinguishes three characteristic phases in the processs. The first concerns the exploration of regions with no established science - and the consequent accumulation and use of data and specimens gathered locally -, by Western Europeans and (later) Americans. The second phase is that of a "colonial", or "dependent", science, a stage in which scientific activities by locals start to develop, even if still dependent on the established cultural centres for scientific training, publication of scientific works, and acquisition of scientific equipment. The final phase is when a fully independent scientific tradition establishes itself, Basalla having stressed, however, that for such attainment, "various kinds of barriers must be surmounted" (Basalla, 1967: 618; 1993: 599).

Basalla's three-phase model has been widely criticized and modified since its publication (e.g., Polanco, 1986; Figueirôa, 1992; Lafuente and Sala, 1989, among others), having been condemned especially by its over-simplistic design

which disregards the dynamics of each individual phase, and the mechanisms that propel the diffusion process from one phase to the next. Such variables are inherent to the political and socio-economic characteristics of each colony or country, and are therefore determinant for the development and diffusion of science within a particular colony.

Despite a widespread criticism to his model, Basalla has recently ratified his views in relation to the diffusion of modern science, having reaffirmed the three interlocking phases proposed on his early model (Basalla, 1993).

Interpreting Basalla's model in the context of the present work, I have verified its unworkability, since during most of the nineteenth century, the "first" and "second" phases of the model occurred simultaneously in Brazil. When J. Trail arrived in Amazonia in 1873, one of his assignments was to collect scientific material to send to a "centre of diffusion" (Britain), where it would eventually be evaluated, studied, and divulged. This stage corresponds clearly to the first phase of Basalla's model. It should be stressed, however, that by the time Trail arrived in Amazonia, a scientific nucleus already existed in Brazil - more specifically in the capital city of Rio de Janeiro. In that southern city, a national institution committed to the study of natural sciences (Museu Nacional)[3] had been active since 1818, with local scientists already involved with the formation of scientific collections and the publication of scientific papers (see Chapter 4). It should also be mentioned that the Brazilian scientific community was by no means involved merely with local issues, since it was reasonably aware of themes and discussions of scientific subjects of universal interest (see Lopes, 1993). Such setting corresponds precisely to phase two of

Basalla's model, what therefore reveals a long-lasting superposition of phases one and two in nineteenth-century Brazil.

Lewis Pyenson (1985a,b; 1989) interpreted, through the perspective of the exact sciences, the relationships between science and imperialism during the late nineteenth and early twentieth centuries. His comparative studies between colonies and independent countries controlled (or staffed) by the Germans, the Dutch and the French, involved three distinct axis composing the strategy for scientific expansion. He recorded them as: a "functionary" axis, entirely and directly subordinated to the metropolis in the academic, military and religious senses; a "research" axis, which sustained a rather loose bond between academic, military and economic interests, and which took regard for the ethics involved in the research; and a "mercantilist" axis, characterized by having science, and scientists, serving exclusively the interests of large companies (Pyenson, 1989). Commenting on Pyenson's model, Patrick Petitjean (1992: 7) praised its less generalistic essence in comparison to that of Basalla. He also highlighted Pyenson's notion of the utilization of science for the development of the empires through the transplantation of European scientists (along with their practices and strategies) to the periphery.

Pyenson's views, however, have been critically reviewed by Palladino and Worboys (1993), who pointed out that his work focused exclusively on the notions of "cultural imperialism" and "civilizing mission", having failed, therefore, to associate imperialism with the idea of "exploitation and domination". They also commented on Pyenson's explicit "little empathy with the "colonized", and on his failure to approach the indigenous perspective. On a reply to Palladino and Worboys, Pyenson (1993:

107) justified his choice for the expression "cultural imperialism" by stating that "it seemed appropriate to one feature of the expansion of imperialist powers in both colonies and independent countries over the past two centuries". He acknowledged, however, that there is still need for learning "about patterns of cultural expansion for other countries and times", and "how other learned disciplines and activities ... spread the influence of nations" (Pyenson, *ibid.*).

In respect to Latin America in particular, Pyenson (1985b) identified two categories of scientific missionaries among those who travelled to that region during the nineteenth and early twentieth centuries: a "functionary" type, who represented the metropolis and devoted all time and effort to its interests; and a "seeker" type, whose goal was to build a professional reputation, and for whom associations with local institutions for developing their careers were sought.

If one examines the activities of foreign scientists in nineteenth-century Brazil through the perspective of Pyenson's model, it seems likely that most cases will conform with either his "functionary" or "seeker" categories. For example: the Swiss-German naturalist E. Goeldi, who came to Brazil in the late nineteenth-century for developing his scientific career, may be classified as a "seeker". This same notion may be equally applied to both the French landscape gardener A. Glaziou and the German zoologist H. Ihering, among others. On the other hand, James Trail may fit Pyenson's definition of a "functionary" scientist. It is my view, however, that Pyenson's categories are somewhat simplistic, since his model does not consider the multitude of background aspects invariably involved with each individual case. As far as Brazil is concerned, I have noted that there is actually a rather tenuous line

separating the personal interests of scientists seeking individual rewards, from those of others representing exclusively the interests of the metropolis. It should be emphasized that most, if not all, foreign scientists who sought associations with Brazilian institutions for developing their careers, never lost sight of the scientific and economic interests of their motherland. This is evidenced, for instance, by the scientific material they collected locally, which was invariably forwarded to the scientific centres of their countries of origin. In a similar fashion, the information gathered was nearly always published in their mother language, generally in journals of difficult access to the periphery. I have concluded, therefore, that at least in regard to Brazil, cases should be investigated individually and much more thoroughly before attempts for applying Pyenson's models can be made possible.

Latour, on his widely consulted work *Science in Action* published in 1987, discusses the formation of the so-called developed scientific centres, which he assumes are established through an intrinsic network of accumulated information defined by him as a "cycle of accumulation". Such centres, in turn, become scientifically dominating by acting, from the distance, on peripheral places. For Latour, the stability, mobility and combinability of the information and collections gathered during the exploratory voyages and sent to the above centres, transformed poorly-informed scientists who had never left a centre into ones who ended up "familiar with more places not only than any native but than any travelling captain as well". Latour (ibid.: 225) also referred to the scientists of the natural history museums of the developed centres, who "without travelling more than a few hundred metres and opening more than a few dozen drawers, travel through all the continents, climates and

periods". For Latour, "... we should marvel ... at this general mobilization of the world that endows a few scientists in frock coats, somewhere in Kew Gardens, with the ability to visually dominate all the plants on earth". Furthermore, he feels that the networks of combined elements formed in the centres represent the ingredient that "sometimes make it possible to dominate spatially as well as chronologically the periphery".

Latour's notion of the dominance of developed scientific centres seems appropriate for interpreting the history of the scientific exploration of Brazil during the nineteenth century. Confirming his projections, all foreign exploring expeditions which collected in the country deposited the material obtained at museums and botanic gardens of the scientific centres of Europe and the United States. Such practice was decisive for the domination, by foreign scientists, of the basic knowledge related to the natural history of Brazil.

Colonialism and related cultural and scientific influence was also examined by M. Paty (1990: 79-86), who re-evaluated the notion of "western science". According to him, western science did not evolve at a "determined geographic, economic, and cultural closed area" (i.e. western Europe), having had, instead, a much more vast "aire de naissance" which includes the whole Mediterranean region (Africa and Middle East included). Seen through such perspective, the development of western science can not be regarded as coincident with the colonial expansion of western Europe, considering that it had been evolving since much earlier times. Following this line of thought, Paty proposes an alternative concept to express the spread of modern science: instead of a "science of imperialism or colonialism", he suggests the concept "pensée scientifique-monde" (scientific world thought) in an analogous

sense to Fernand Braudel's concept "l'économie-monde" (world economy). Paty's concept considers the early exchanges which took part between cultures of the Mediterranean and those of the rest of Europe as fundamental to the process, and therefore does not contemplate "western science" as an exclusive consequence of the great voyages of discovery. He does not overlook actual relations of domination, neither ignoring the relevance of the great voyages and maritime expansion, nor the importation of the "élements de base" (the indigenous cultures and civilizations) to the proccess. He just confers, however, a much broader dimension to the notion of "modern science", considering it rather an universal process.

Also commented upon by Paty (1990: 84-86) is the widespread difficulty of dissociating modern science from the imperialist or colonialist context. According to him, imperialist or colonialist domination is not always a mere pre-requirement for exploitation, so scientific influence can sometimes constitute a rather independent element. He recommends, therefore, that different situations should be analyzed in detail in order to consider all possible influences (i.e. those from individuals, institutions and governments) besides those concerned only with policies of domination.

Paty's considerations referred to above are pertinent to the present work. I feel that his proposition of a "scientific world thought" for characterizing "western science" is adequate, and also see it as an universal process influenced by a variety of factors other than just those traditionally considered. I oppose, however, his inclination to dissociate scientific influence from domination, and choose to see it only as a mere attempt to interpret an historical fact through a romantic perspective.

As Paty himself infers, though, such dissociation represented just a temporary event in the history of imperial domination.

At least in regard to Brazil, the strong link which always existed between the domination of scientific knowledge and exploitation is readly identifiable. In Trail's case, for instance, the association was evident during all phases of the exploratory voyage, being also intrinsic in an overall disregard for the native naturalists and their scientific knowledge. I fully agree with Browne's (1996: 312) interpretation of the real purposes of scientific exploring expeditions, when she comments that "expeditions were drawn up to fulfil complex administrative and national purposes, in which geographical exploration and the glamour of discovery were often only secondary elements"

In recent years, attention has also been drawn to "scientific colonialism" within developed scientific centres such as Britain, having Martin Rudwick (1985) on his *"The Great Devonian Controversy"* and David Knight (1991) on *"Tyrannies of Distance"* discussed the subject. Rudwick analyzed the 1830s and 1840s scientific debate on the geology of Devon (southwest England), which involved the most respectable British geologists of the early nineteenth-century (such as George Greenough, Henry Thomas De la Beche, Adam Sedgwick, Charles Lyell, and Roderick Murchinson) and some provincial ones (e.g. David Williams and Robert Alfred Austen). Besides other points, Rudwick demonstrated how provincial geologists were regarded by those of the "elite", who saw them as mere providers of local scientific information for the development of their theories. Rudwick (*ibid.*: 423) reports the specific case of the clergyman David Williams, a provincial geologist

from Somerset (southwest England): "... who repeatedly claimed the right to pronounce on the wider theoretical implications of his fieldwork and fossils from southwest England, but who was repeatedly pushed back down the invisible gradient of scientific status by the scorn of the elite geologists". Regardless of his sensible opinions and relevant scientific work, Williams was referred to by the geological elite as a "mere zealous collector" (Rudwick, *ibid.*).

Knight (*ibid.*) adds that in nineteenth-century England, geographical distance was not the single cause of scientific segregation, being the scientist's social status also a barrier for acceptance. As he pointed out (Knight, *ibid.*: 39): " The position of somebody in the north of England ,..., was not so very different from that of a colonial..." . "Those living in provincial towns in England found, and still find, what must also be familiar to Australians; that the most eminent intellectuals who grew up there went to the London area to make their careers...".

Trail was a typical provincial scientist with limited social status, whose successful career developed almost exclusively in the peripheral city of Aberdeen (see Sub-chapter 3.1). Despite his contributions to palm taxonomy and studies on plant diseases, he was most probably seen by scientists of the centres as a peripheral naturalist and mere "provider" of specific scientific information.

Lafuente and Sala (1989), on their work on colonial science in eighteenth-century Spanish America, critically reviewed the models which attempted to explain the spread of modern science to peripheral countries with a colonial past. In that direction, they analyzed the three factors most widely used by others authors, to conceptualize the process of difusion of western science, which are: the geo-political (which assumes the existence of both a peripheral and a metropolitan science); the

socio-economic (regarded as having led the periphery to a situation of technological dependency); and the socio-professional (believed to have originated in both a marginal and an academic science). Lafuente and Sala came to the conclusion that models invariably failed by disregarding the local (endogenous) factors of scientific development. In this respect, they noted that eurocentrism customarily diminished local contributions by despising all cultural values not expressed in the format of a scientific discovery.

Based on their analysis, Lafuente and Sala (*ibid.*) proposed a different characterization for "colonial" science, which they understand should be viewed as an unique historical development that, although linked to the exterior through several mechanisms of communication, was nevertheless original in respect to the professional roles played by local scientists, and the forms of institutionalization of local scientific activities. According to the above authors, such notion permits one to: a) "avoid an overestimation of the role of the metropolis and/or centres in the development of scientific activities in the colonies and/or peripherial areas"; b) "understand the internal dynamics of such activities in colonial spaces"; and c) "enrich and differentiate the diversity of socio-professional roles that were involved in the process of propagation, acceptance and naturalization of scientific practices and ideas" (Lafuente and Sala, *ibid.*: 387).

It is my view that Lafuente and Sala approached quite adequately the issues related to the institutionalization of scientific activities in colonial and ex-colonial countries. Even considering that the history of the colonization of Brazil by the Portuguese (and the development of scientific studies in the country) was somewhat

distinct from that which unfolded in the countries of Spanish America, the points explored by Lafuente and Sala are also pertinent to Brazil (and thus to the case-study represented by Trail's voyage to Amazonia). Worth of note is the fact that, similarly to the case study explored by Lafuente and Sala - i.e. the study of colonial science in Nueva España (Colombia) -, the present study also evidences the drawbacks of applying to Brazil any of the models proposed by earlier authors.

I agree with Petitjean (*ibid.*: 6), who declares that models, although stimulant to reflections and the elaboration of hypotheses, are at the same time extremelly restrictive in relation to our understanding of historical events in their completeness. In full agreement with present historians of science, I also regard as precipitate the use of universal models for interpreting the diffusion of science. As Kohlstedt (*apud* Stafford, 1988: 69) points out, "the time may yet be premature for the application of elaborate developmental models and fine weightings of internal versus external influence as appropriate means for analysing the meaning of colonial or imperial science". It is my view that, before the consolidation of any model or paradigm is possible, more thorough studies on the interrelationships of each individual colony, or former colony, with their contemporaneous metropolitan scientific centres should be carried out. In this respect, extensive investigations are strongly needed on the scientific development of individual peripheral places through the development of case-studies. As Stafford recorded in relation to the Australian coal case: "More work is certainly required before we can construct with tolerable accuracy an historical framework that will incorporate individuals, institutions, intellectual trends, and the multivarious external factors impinging on the scientific enterprise, while at the same time expressing the dynamics that link them together".

The present study on Trail's voyage to Brazilian Amazonia should be viewed as a case study developed through the perspective of the issues above. One of its objectives is to demonstrate the close relationship between science and imperialism, what is done by recording the activities of an informal British empire in South America during the nineteenth century. Complementarily, the study also analyzes the economical, political and social factors intrinsically linked to the objectives of Trail's exploratory voyage to Amazonia, and discloses his somewhat arrogant posture as a member of a cultural centre. To my knowledge, such inclusive approach has not yet been adopted for studies related to foreign nineteenth-century scientific exploration in Brazil.

1.4. The growing knowledge of the natural history of Brazil throughout the nineteenth century: the contribution of foreign naturalists

The nineteenth century represents a turning-point in the search for information regarding the natural history of Brazil. This progress happened especially from the increased activity of foreign natural scientists in the country throughout the century, from whose works originated the greatest amount of information ever produced on the fauna, flora and geology of Brazil. Among the main works published at the time, the magnificent *Flora Brasiliensis* stands out. Edited and organized by the German scientist Karl F. P. von Martius, it involved 65 botanists and took 66 years to complete. Also worthy of note is the precious *Oiseaux brillans et remarquable du Brésil*, published by the French

Theodore Décourtilz in 1835, and *Birds of Brazil and Mexico*, produced by the British naturalist William Swainson in 1841.

Since the occupation of the eastern portion of South America (later Brazil) by the Portuguese in 1500, news of the plants and animals of that part of the "new world" started to reach Europe. In fact, few were the reports which did not include comments, even if largely bizarre, on the natural history of the region. As reported by Rodolfo Garcia (1922) and Mello Leitão (1937a), however, some reasonably accurate descriptions of local animals and plants were produced at the time, among which should be mentioned those by the German traveller Hans Staden (1557); the French missionary André Thevet (1558), the Portuguese missionary José de Anchieta in 1560 (but only published in 1799), the French explorer Jean de Lery (1585), and the Portuguese plantation owner Gabriel Soares de Sousa in 1587 (but only published in 1825).

The seventeenth century was marked by the Dutch invasion and occupation of northeastern Brazil from 1630 to 1661, and the arrival, in 1637, of the first foreign scientific mission to the country. Under the command of the enlightened Count Johan Maurits of Nassau-Siegen, the governor of the new Dutch colony, the scientific mission formed by the naturalist Georg Marcgraf, the physician Wilhem Piso, and the artists Albert Eckhout and Frans Post, took back to Europe a collection of animals and plants in addition to a set of watercolour and oil drawings depicting the natural history of the region (Mello Leitão, *ibid.*: 79). The posthumous work of Marcgraf (he died in Angola in 1644, a year after he left Brazil), which was published in 1648 co-authored by Piso, became for nearly two centuries the most important source of information on the natural history of Brazil. As recorded by Boeseman et al. (1990: 5) "many new species first

recorded in Marcgraf's work received proper Latin names and were thus validated for science by Linnaeus (1758, 1766)".

The eighteenth century represented for Europe an epoch of expansionism, which motivated great scientific voyages such as those of the French Louis A. de Bougainville in 1766; the British James Cook in 1768, 1772 and 1776, and the French Jean-François de Galaup, Comte de La Pérouse in 1785.[5] Earlier in this same century, a breakthrough in the study of natural history happened through the creation, by the Swedish naturalist Carolus Linnaeus, of a new method for classifying the natural world. Natural history collections had become fashionable in Europe since the 17th century, with the arrival of exotic novelties collected around the world. After the adoption of Linnaeus' new system of classification and binominal nomenclature (Linnaeus, 1735; 1737; 1753), these collections had their scientific value markedly increased. As recalled by Stearn (1984: 247) in relation to the botanical classification, the "pre-1753 nomenclature tended to be awkward, unstable and inconsistent". The adoption of an universal system helped natural scientists to better organize and classify the natural world, and a period of great progress in taxonomy followed.

In the meantime, Brazil, as a colony of Portugal, stood apart from the scientific and industrial changes occurring in Europe at the time. Portugal itself only started to adopt enlightened ideas by the middle of the eighteenth century (see Novais, 1989; and Dias, 1968; among others). As a consequence of Portugal's late scientific development, it only sent its first truly scientific expedition to Brazil in 1783 (Ferreira, 1972).

Even though the Portuguese expedition to Brazil spent no less than 9 years surveying the northern and midwestern provinces of the country, it had no repercussion

whatsoever among the international scientific community. This happened because Portugal followed the tradition of not publicizing information of any kind regarding its colonies. Such posture, followed since the first reports produced by the Portuguese missionaries in Brazil (Mello Leitão, *ibid.*: 882), persisted for the works produced later by the Brazilians commissioned to study the natural history of the colony (e.g. Vellozo *in* Borgmeier, 1961; and Arruda Câmara, 1982).

Besides impeding access to information on its colonies, Portugal also prevented foreign scientific and/or exploratory missions - such as circumnavigation voyages - from stopping in Brazil, even for short periods of time (Cook *in* Beaglehole, 1955).

The above ingredients were detrimental to a better knowledge of the Brazilian fauna and flora. The unfavourable conditions prevailed until the beginning of the 19th Century, when scientific expeditions and travellers were finally allowed into the country (see Chapter 2).

The admittance of foreign naturalists to Brazil marked the beginning of a new era regarding the scientific development of the country. As stressed by Ab'Saber et al. (1980: 122-3), the arrival of the European scientific missions "redounded to a severe rupture (of Brazil) with the colonial past in terms of scientific observations ...". Lopes (1993), on her work on the formation of the Brazilian natural history museums during the nineteenth century, reported that a further relevant contribution of foreign scientists to the scientific development of Brazil during the nineteenth century was their support for consolidating the country's scientific institutions.

It has been argued that the impact of foreign expeditions for the Brazilian scientific community of the nineteenth century was moderate, since the material

collected was invariably shipped to Europe for study and the results published in foreign languages. As Mello Leitão (*ibid*: 257) points out: "the type specimens of nearly 80% of the Brazilian species ... should be searched for in the museums of Vienna, Berlin, Paris and London". Seen from a broad perspective, however, the work of foreign naturalists in Brazil added substantially to the development of science as a whole, both at national and international levels.

Among the natural scientists who visited Brazil, the British are acknowledged for having contributed a most notable legacy to the natural history of the country. Their activities in Brazil goes back to 1807, when John Mawe explored the hinterland provinces (Mawe, 1812), and have continued ever since. Worth of note were the visits of William Swainson to the provinces of Pernambuco, Bahia and Rio de Janeiro in 1816-18 (Swainson, 1989); Charles Robert Darwin (as the naturalist on board H.M.S. *Beagle*) to the provinces of Bahia and Rio de Janeiro in 1832; and George Gardner to the provinces of Rio de Janeiro, Pernambuco, Alagoas, and Ceará in 1836-41 (Gardner, 1846). Darwin, by the way, later developed revolutionary ideas on the diversity and evolution of life on earth, theories that were based on his field observations throughout the world, including Brazil (Darwin, 1859; see also Browne, 1995). The conspicuous presence of British naturalists in Brazil has caught the attention of local scientists (Mello Leitão, 1937b; Lutz, 1941; Leonardos, 1970), who recorded their activities in the country.

The Amazon region was already in the nineteenth century a much praised place for naturalists due to its extraordinary biodiversity. Not surprisingly, during that epoch the British concentrated in Amazonia most of their efforts for exploring the natural history of Brazil (e.g. Bates, 1848-1859; Wallace, 1848-1851; Spruce 1849-1855).

The voyage of the naturalist James W. H. Trail, which is the theme of this work, also happened in the scenario of nineteenth-century Amazonia. Contrary to those who preceded him, however, he has not yet had his activities recorded, nor his contributions to the natural history of the region properly evaluated.

1.5. An overview of the natural history exploration of the Brazilian Amazon region in the nineteenth century

"How happy I feel here, and how fully I [now] understand much of what remained inaccessible until now! This sacred place, where all forces merge harmoniously and reverberate as a triumphant chant, stimulates sensations and thoughts. It makes me better understand the meaning of being a naturalist ..." (impressions of the German botanist Karl Friedrich von Martius on his first night at the Amazonian city of Belém, in 1819 (Martius, 1831 [1981]).

As mentioned below in Chapter 2, the Brazilian portion of Amazonia remained virtually closed for foreign exploration until the begining of the nineteenth century.

The Germans were the first to obtain permission to enter the region, which happened even before Portugal opened the Brazilian ports to allied nations in 1808 (see Chapter 2). In 1801, the German Johan Centurius, Count von Hoffmannsegg, taking advantage of his good relationship with the King of Portugal, sent to the Brazilian Amazon region his servant and preparator of natural history material, Friedrich Wilhelm Sieber. Travelling at the Count's expense, Sieber collected for 12 years around Belém and throughout the lower Amazon, putting together a

representative collection of natural history specimens (mainly insects) from that area (Papavero, 1971). Sieber's Amazonian collection was later donated by the Count Hoffmannsegg to the Berlin Museum.

In 1819, i.e. six years after Sieber left Amazonia, two other German naturalists arrived in the region: Karl Friedrich Philipp von Martius and Johann Baptist von Spix. The two travelled and collected extensively throughout Brazil for 2 years (1817-19), 11 months of which were spent exploring the Amazon/Solimões River as far upriver as Tabatinga (the present border with Peru). Martius and Spix were financed by the King of Bavaria, Frederick I, and thus forwarded to Munich all the material they collected in Brazil. At the time, such collections formed the basis for all the botanical, zoological, and ethnographical studies related to the Brazilian Amazon region (Spix & Martius, 1823; 1828; 1831). Martius and Spix's collections, including their Amazonian material, are now deposited at the Munich Museum of Natural History.

After Spix and Martius, the next foreign naturalists to travel and collect in the Brazilian portion of Amazonia were the members of an expedition financed by the Russian Government and led by the Russian Consul in Brazil, the German naturalist Baron Georg Heinrich von Langsdorff (Becher, 1990). The expedition, which left Rio de Janeiro in 1825, explored the south and west of Brazil until 1827, when it reached the Amazon region. There its members splitted in two groups to explore the rivers Madeira, Tapajós and Negro, after which the parties headed for Belém (Pará), where they reunited in October 1828. The Langsdorff Expedition (as later it became known) left Amazonia in January 1829, the collections gathered being split between the St.

Petersburg Academy of Science and the Paris Museum, where they have remained largely unstudied until today (Komissarov, 1994; Papavero, ibid.).

The trip of William John Burchell to Brazilian Amazonia marks the beginning of the exploring activities of British naturalists in that region. Self-financed, Burchell explored the southeastern and central parts of Brazil after his arrival to the country, in July 1825. He only reached Amazonia in 1829, when he sailed down the Rio Tocantins (one of the main tributaries of the Amazon river) and arrived in Belém (Pará) in 26 June 1829 (Ferrez, 1981). In that city, Burchell spent 8 months collecting zoological and botanical specimens, on which he commented on his manuscript (now kept in the Library of the Hope Department of Entomology, Oxford University (Papavero, 1971):

"While waiting till February [I] added largely to my collections both in zoology and botany. On this city I made a panorama, which, with that of Rio, I hope perhaps to succeed in getting graved, together with landscapes, etc. Of insects I found from 16 to 20 thousand specimens (at a guess). Of birds I shot and preserved 362 species. In the other classes a proportionally smaller number."

Another significant collection made in Brazilian Amazonia during the early nineteenth century was that obtained by the Austrian collector Johann Natterer, who worked in that region between 1829 to 1835. As member of an expedition financed by the Austrian Government to collect material to the Naturhistorich Museum of Vienna, Natterer travelled extensively throughout Brazil since his arrival in Rio de Janeiro in 1817. In Amazonia, he successfuly explored the Rio Madeira, the lower Amazon, and the Rio Negro and several of its tributaries, having reached San

Carlos, in Venezuela, from where he proceeded to the mouth of the Cassiquiare Channel (which links the Amazon and Orinoco river basins). Regrettably, however, part of Natterer's collections and manuscripts were lost in 1849, during a fire at the Naturhistorish Museum (Goeldi, 1896). The surviving specimens are now incorporated to the Museum's general collection; the remaining manuscripts and personal papers are deposited at the Museum's Archives and (in part) at the Humboldt Universitaat, in Berlin.

In 1847, a French expedition proceeding from Peru entered Brazilian Amazonia through the border village of Tabatinga. The expedition was leaded by the entomologist and founder of the French Entomological Society, the Count Francis Marie de Laporte of Castelnau, who had, as his travel companions, a botanist, an engineer, and a preparer of natural history specimens (see note on Sub-chapter 2.2). The main purpose of the expedition was to find a communication between the basins of the Amazon and La Plata rivers, which was sought for establishing a continuous navigation route to link the West Indies to the city of Buenos Aires, in Argentina (Garcia, 1922). Having already explored southern and central Brazil, as well as parts of Bolivia and Peru, the expediton spent three months sailing down the Amazon river from the Brazilian/Peruvian border to the river mouth in Belém. The natural history collections gathered by Castelnau and party in South America were partially donated and partially sold to the Museum National d'Histoire Naturelle, in Paris (Papavero, ibid.), where they still remain today.

A self-financed, individual explorer who sailed the Amazon river from the Brazilian border with Peru to its mouth in Belém (Pará) was the German Eduard

Friedrich Poeppig. From August 1831 to August 1832, he carried out a natural history and ethnographic exploration of the upper and lower Amazon, having obtained a sample of local animal and plant species. The material collected by Poeppig in Amazonia has been scattered throughout the main institutions of Europe (see Urban, 1906: 78).

Another individual explorer to travel throughout the Brazilian Amazon region was the Italian Gaetano Osculati who, between 1846 and 1848, sailed the Amazon from the border village of Tabatinga to the river mouth in Belém. Through his travels, Osculati hoped to contribute to the development of the study of natural sciences, and bring "glory to his homeland", which he intended more precisely by donating his collections to the Museum of Milan, in Italy (Osculati, 1854, in Oliveira Filho, 1980).

Even though the British Government never sent any formal natural history expedition, or commission, to explore the Brazilian Amazon region (as did the French and Bavarians, as mentioned above), British geographers had been in activity in the region since the 1820's. In fact, they were the first, in the nineteenth century, to sail the Amazon river from Perú to its mouth in Belém (see Sub-chapter 2.2). As far as natural history is concerned, however, British naturalists only started to explore the hinterland of the Brazilian Amazon region after 1848, as seen below.

On September 1830, H.M. Sloop *Chanticler* made a stop at Belém (Pará). This expedition, commanded by Captain Henry Foster, had sailed from England on 27 April 1828 with the mission of determining the exact curvature of the earth. For natural history research, Foster was assisted by the ship's surgeon, W.H.B. Webster. The *Chanticler* spent a month and six days in Belém, what gave Webster

the opportunity of exploring the city and its surroundings. He later produced a good account of the natural history of the area, which includes the following comments (Webster, 1834):

"The botanical productions of this place would require volumes to detail... The palms are among the most conspicuous and useful of the vegetable kingdom... There is the slender and slim *areca* (sic) *tenuis*; the *acrocomia* (sic) *fusiformis*, and the *mauritia* (sic) palms... The bignonias are abundant, and among them one could not but admire... The country abounds with wild animals, monkeys, snakes and lizards; in fact every department of nature is rich in the extreme, and a thousand interesting subjects might be selected."

On 26 May 1848, two young British naturalists, as yet in their early twenties, arrived at Belém, Pará, with the objective of exploring the region and collecting natural history specimens. They were Henry Walter Bates and Alfred Russel Wallace, whom at that time were already seeking information on the variability and evolution of species. To finance their work in the region, both had planned selling specimens to European scientific institutions. Wallace spent 4 years and 2 months in the Amazon region, and Bates 11 years. At first, the two remained together, having jointly explored the area around Belém and sailed the Rio Tocantins on a 5 week journey (26 August to 30 September 1848). After that, however, Wallace and Bates travelled separately, having each sailed up the Amazon River following a different route. They only met again in Manaus, in 1850, from where they again took different routes, with Wallace exploring the Rio Negro and Bates descending the Solimões (i.e. upper Amazon).

Wallace spent 2 years exploring the Rio Negro and its tributaries, after which, on 12 July 1852, he embarked on the brig *Helen* to return to England. Unfortunately,

however, the ship went on fire and Wallace lost all the collections he had obtained during his latest travels in Amazonia. Besides Wallace himself, only a couple of his notebooks survived the wreckage, included in which were some drawings of Amazonian plants and animals (see George, 1979).

After Wallace' s return to England, he published a book on the various aspects of the region he had visited, a work which includes not only accounts on the natural history of Amazonia, but also commentaries on the social habits of the local people and geographic descriptions of relevant localities. In this same work, he also attempted to associate the fauna of the region with its geology. The most significant aspect of Wallace's work in Amazonia, however, is the bulk of observations he made locally, most of which certainly contributed to the development of his ideas on natural selection and evolution.

Bates, on his turn, was successful in remaining 7 more years in the Amazon region after Wallace's departure. On his travels, he went as far as São Paulo de Olivença, in the upper Amazon, and did not proceed even further towards the Peruvian cities of Peba and Moyobamba, due to an illness which afflicted him at the time. Bates returned to Belém on 17 March 1858, remaining in that city until 2 June 1859, when he finally left for England, via New York, on board the U.S. vessel *Frederick Demming.* For security reasons, however, he divided his collections in three portions, which were sent home in separate ships so as not to risk the loss of the whole lot.

Bates took to England more than 8,000 insects new to science, and was one of the most successful natural history collectors of Amazonia of all times. Besides

the notable zoological collections, however, he also contributed to the knowledge of the natural history of the region, as well as to the then emerging ideas of natural selection and evolution, through his works on insects (see Dickenson, 1992). Bates' narrative of his natural history exploration of Brazilian Amazonia (Bates, 1862) became one of the most popular travel books of all times, having been republished and translated to other languages since its first edition (Dickenson, 1992). Bates' lively and inspiring description of the Amazonian forest and the animals which inhabit it deserved the following commentary by Charles Darwin:

"Bates is second only to Humboldt in describing a tropical forest".

In 1849, another British collector, Richard Spruce, sailed to Belém (Pará). Similarly to Bates and Wallace, he also intended to finance his travels by selling botanical collections to European herbariums and museums. Kew's botanist George Bentham (see Sub-chapter 2.1) advanced him funds for the trip, and agreed to act as his agent in Britain during the time he would spend abroad. Spruce spent six years (i.e. 1849 to 1855) exploring the Brazilian Amazon region, having surveyed the lower Amazon and sailed the Rio Negro as far north as São Gabriel, in Venezuela.

Spruce left the Brazilian Amazon region for Peru, sailing up the Rio Pastaza to Ecuador, where he was to accomplish a special task. While in the Andean region in 1859, Spruce received a special request from Sir William Hooker, from Kew: he should collect seeds and live specimens of the "cinchona" bark, or Peruvian bark tree, a plant which contains the chemical ingredient quinine used in malaria therapy

(Smith, *1990:* 256). To help Spruce achieve his goal, a Scotch gardener, Robert Cross, was sent to Ecuador in 1860. A few months after the two men met, 100,000 dried seeds and 637 young plants were shipped to England for a later transship to India (Spruce, 1908: 260-309 *in* Brockway, 1979: 114).

Spruce is justly considered one of the most efficient botanical collectors ever to work in Amazonia, having gathered locally a collection of nearly 30,000 plant specimens, of which no less than 7,000 were later revealed to be new to science (Wallace *in* Spruce, 1908). Besides his admirable collecting skills, he also deserves credit for the detailed field information which accompanies the specimens. The collection obtained by Spruce in Amazonia still represents today a most significant sample of the botanical diversity of that region.

The year of 1850 represents a mark in the socio-political history of the Brazilian Amazon region, since it was then that political measures for occupying the region were adopted, and a pioneer navigation company was launched in the region: the Companhia de Navegaçao do Amazonas (see Chapter 2). The regular liners which began to ply the Amazon River significantly improved travelling conditions, and put to an end the dependence of exploring naturalists on small rented boats with their crew of locals (mostly indians).

The first scientific expedition to arrive in Brazilian Amazonia during this new era was the one led by the Swiss-American zoologist Louis Agassiz. Financed by the Bostonian banker Nathaniel Thayer, and counting upon full support from the Brazilian Government, Agassiz's expedition was the major occurrence of the second-half of the nineteenth century in terms of the natural history exploration of the

Amazon region. After having explored the south and the northeast parts of Brazil, Agassiz, wife and party arrived in Amazonia in August 1865. Besides his intention of collecting specimens for the Museum of Comparative Zoology, in Cambridge, Massachussetts, he also intended to search for evidence (particularly ichthyological) for refuting Darwin's theory of transmutation (Agassiz and Agassiz, 1975: 35). As noted by Winsor (1991: 71-2), however, even though Agassiz claimed that he collected in Amazonia two thousand species of fish, and that such a collection would create a revolution in ichthyology, he actually never published on the implications of his Brazilian collection, less still on the theory of evolution. Instead, his published works focused on his views - today proven wrong - of the formation of the Amazon basin through sucessive glaciations.

By the time Agassiz was exploring the upper Amazon, members of an expedition commisioned by the Spanish Government to explore its ex-colonies in the Pacific region, arrived in the Brazilian border city of Tabatinga coming from Peru. The commission, formed by the Spanish explorers Isern, Espada y Martinez, and Almagro (Puig-Samper, 1988), intended to proceed down the Amazon river to its mouth in the Atlantic, and from there sail home to Spain. On 19 September 1865, the Brazilian steamship *Icamiaba,* with Agassiz and his travelling companions on board, transported the members of the Spanish expedition from Tabatinga to Tefé, which was the village where the American naturalists had set a base in the upper Amazon. During their journey down the river, the members of the two expeditions got acquainted with each other, agassiz having Agassiz noted on the occasion the rich collection of live animals the Spaniards were taking home (Agassiz and Agassiz,

ibid). Agassiz later heard that the Spaniards eventually made it to Belém, where they arrived in 12 October 1865, and from there successfully crossed the Atlantic and got to Madrid (Agassiz and Agassiz, *ibid.*).

Following Agassiz's footsteps, two other American scientific commissions travelled to the Brazilian Amazon region shortly after. The first arrived in 1867, and was lead by the Protestant minister and naturalist James Orton, who was also a lecturer at the University of Rochester, U.S. The expedition was half financed by the Williams College Lyceum (Ewan, 1989: 2), which contributed US$ 500 for the venture, the participants having paid for their own travel expenses. Orton's expedition crossed the South American continent from Guayaquil, in Ecuador, to Belém, Pará, on a long journey down the Napo and Amazon rivers. Based on his field observations, Orton came to disagree with Agassiz's glaciation theory, maintaining instead that the Amazon Valley was of marine Tertiary origin (Garcia, 1922: 901). Orton returned to the Amazon region two more times, first in 1873 and later in 1877, when he ended up dying in Lake Titicaca, Bolivia (Ewan, *ibid*).

In 1870, yet another American expedition - later to become known as the Morgan Expedition - penetrated the Brazilian Amazon region. Financed by Junius S. Morgan and led by Charles Frederick Hartt, the expedition brought eighteen students from Cornell University to investigate the geology of the lower Amazon. Hartt, who had been one of Agassiz's students and a member of his 1865 expedition to Brazil, opposed the notion of a glacial origin for the Amazon Valley as advanced by his former master. Hartt and his travel companions surveyed the lower Amazon and discovered Devonian fossils at the Ereré region. Later, in 1871, Hartt returned to

the lower Amazon accompanied by his disciple, Orville Derby. This second trip to Brazilian Amazonia was also financed by J. Morgan (Mendonça *in* Hartt, 1941).

As discussed in detail in the following Chapters, in 1873 the British "Amazon Steam Navigation Company" - formerly the Brazilian "Companhia de Navegação do Amazonas" -, launched an expedition to survey its lands in the valley of the Amazon River. The expedition was led by the geologist Charles B. Brown who, together with his travel companions - the engineer William Lidstone and the botanist James H.W. Trail -, explored nearly 15,000 miles of the Amazon River and tributaries in 18 months (see Chapter 2). Even though the purpose of the expedition was eminently commercial, the observations made on the natural history of the region, and the samples collected, ended up by confering upon it a scientific character. Such diversification was particularly due to the work of James Trail, a naturalist by vocation who took the once-in-a-lifetime opportunity to shape his future career in natural history. Trail's work in Amazonia is the theme of the present work, and is fully investigated in the following Chapters.

In 1874, Herbert Huntington Smith, one of the former Cornell students who had participated in the Morgan expedition of 1870 (see above), arrived in the lower Amazon. As Smith himself defined his objectives: "I returned to Brazil with the design of collecting and studying the Amazonian animals" (Smith, 1879: vii). With this purpose in mind, he settled in Santarém, at the mouth of the rio Tapajós (a tributary of the Amazon). In 1875, while in Amazonia, Smith was commissioned by his former master, Charles Frederick Hartt, a member of the Brazilian Imperial Geological Commission, of which Hartt had become the chairman. In 1876, Smith and yet

another of his former Cornell colleagues, Orville Derby, travelled to the lower Amazon and tributaries under the auspices of the Brazilian Government to study its geology. Smith worked for more than a year for the Brazilian Commission, after which he returned to the U.S. On his return home, he was successful in obtaining financial support to travel to Brazil once again from a commercial establishment - Scribner & Co. -, which contracted him to write articles for its magazine. Smith's exploring experiences in Brazil are detailed in his book *"Brazil, the Amazons and the Coast"* (Smith, *ibid.*).

Smith returned yet again to Brazil in 1881, this time as a free-lance commercial collector of natural history specimens (Papavero, 1973). When in Rio de Janeiro, however, he was hired by the Brazilian National Museum to collect specimens for that Institution, having been allowed in return to keep the duplicates for himself. Regretably, however, he did not comply with the arrangement and took to the U.S. all the insect specimens he collected during the five years he travelled throughout Brazil supported by the Brazilian Government (Lacerda, 1905; AAHC-MN, doc.12, 1881).

In 1876, Henry A. Wickham, an Englishman living in the village of Santarém, in the Brazilian Amazon region, was commissioned by Joseph Hooker, then Director of the Royal Botanic Garden, Kew, to collect and dispatch to Kew seeds of the rubber-tree *Hevea brasiliensis*. Previous attempts to obtain and deliver rubber-tree seeds to England had failed, and Wickham was chosen to undertake such difficult task due to his field experience in Amazonia. Indeed, Wickham succeeded in

obtaining and sending 7,000 seeds of *Hevea* to Kew in 1876, a manoeuvre that was to precipitate later on the collapse of the Brazilian monopoly on rubber production (see Sub-chapter 4.3).

After 1880, few foreign expeditions entered the Brazilian Amazon region. Notable exceptions were the anthropological expeditions that visited the lower Amazon after 1880 (such as those of the French Henry Coudreau and the German Karl von den Steinen, among others). Worth of special note since dealing with natural history, however, was that of the Bavarian Princess Therese von Bayern who, at her own expenses, travelled to the lower Amazon in 1888 to collect natural history and ethnographical material. Of the material obtained by the Princess' expedition, at least part was subsequently studied by specialists in Europe (Urban, 1906: 119)

In 1895, the Trustees of the British Museum received a request from Mr. Alexander Siemens, of the private company Siemens, Bros & Co., to nominate a member of the Museum staff to participate in an expedition that was about to set out to the Amazon region, where the Company was going to install a telegraph cable between the cities of Belem and Manaus. The naturalists selected by the Trustees were Ernest Edward Austen, of the Department of Entomology, and Frederick O. Pickard Cambridge, who at the time was working on Arachnida at the Museum.

The Siemens expedition reached Pará on 4 January 1896, and spent eleven weeks exploring the Amazon River as far upriver as Manaus. Even though the British collectors stayed only for a relatively short time in the region, they were able to obtain a significant number of insect specimens (2,500), besides the other various

zoological groups collected. Works on the expedition and on the material obtained were published by Austen (1896) and Pickard Cambridge (1896).

The last British expedition to enter the Brazilian Amazon region during the nineteen century was the so-called "Rubber-Prospecting Expedition" of 1897. David Thomas Gwynne-Vaughan, at the time demonstrator and lecturer in Botany at the University of Glasgow, was the botanist of the expedition. The botanical material obtained by him in Amazonia was deposited in the Royal Botanic Garden, Kew.

As far as nineteenth century exploration of the natural history of Amazonia by the Brazilians themselves is concerned, the earliest efforts were made after the creation of the Museu Nacional in 1818, in Rio de Janeiro. With the purpose of forming a natural history and ethnographic collection for the Museum, collectors were commissioned by the Government to obtain specimens throughout Brazil, including Amazonia (see Netto, 1870 and Lacerda, *ibid.*).

After the creation in Brazil of provincial museums and scientific institutions (e.g. Museu Goeldi, in Belém, and Museu Paulista, in São Paulo), other natural history collections from the Amazon region were gradually formed.

1.6. Search for the source materials

In view of the nature of the study, a thorough search for extant primary sources pertaining to Trail's Amazonian voyage (field notes, correspondence, scientific reports and related documents) was carried out in several institutions, both in the U.K. and Brazil. For the material deposited in Britain, the compilation by Bridson *et al.* (1980) was found a most useful introduction.

The British institutions which hold the bulk of the documentation pertaining to Trail's work in Amazonia and his collections, are Aberdeen University and the Royal Botanic Gardens, Kew.

The Archives of the Aberdeen University Library keeps the three volumes of Trail's unpublished Amazonian travel diary; the equally unpublished catalogues of the zoological and botanical material he collected in Amazonia; and a manuscript of a lecture on the voyage, read by him during a scientific meeting.

The Library and Archives of the Royal Botanic Gardens, Kew, holds Trail's Amazonian correspondence with Kew's staff, including that with Dr. Joseph Hooker; a notebook containing a few annotations related to the voyage; and a translation (into English) of a French work which includes comments on Trail's study of Amazonian palms. The material consulted at Aberdeen and Kew formed the basis for the development of the work.

Supplementary material consulted at the Library of the Department of Botany of the Natural History Museum, London, was: the correspondence and manuscripts of works by the botanist George Dickie, which includes documents related to his studies on the algae collected by Trail in Amazonia. Also consulted was the material deposited at the Royal Entomological Society, London, which includes the correpondence of the entomologists David Sharp and Arthur Butler, both of whom utilized Trail's specimens on their work.

The Public Records Office, London, holds a file containing contracts of the Amazon Steam Navigation Company.

In Brazil, the main repositories of historical and scientific documents pertaining to nineteenth century (Imperial) Brazil are located in the cities of Rio de Janeiro and Petrópolis. Since no previous inventory of natural history documents is available, a thorough search was carried out in all institutions.

Consulted at the Arquivo Nacional were the early official reports of the Pará and Amazonas Provinces, and the reports of the Ministry of the Brazilian Empire, both of which disclosed facts related to the political and economical history of the nineteenth-century Brazilian Amazonia.

In the Arquivo Histórico do Ministério de Relações Exteriores (Itamaraty), some of the correspondence of the Baron of Mauá (one of the founders of the A.S.N. Co.) was examined. The reports of the meetings of the A.S.N.Co., which were held in London, were located at the Biblioteca Nacional as part of the "Benedicto Ottoni Collection". Also consulted in this same Library was the correspondence of the Baron of Mauá, and the records of the Library and Public Archives of Pará, tomes I-XII.

At the Archives of the Instituto Histórico e Geográfico Brasileiro, a search for documents related to the Brazilian botanist J. Barbosa Rodrigues and the Baron of Mauá was carried out.

At the Archives of the Museu Imperial, Petrópolis, the correspondence and personal papers of J. B. Rodrigues was located as part of the "Capanema Collection".

The Arquivo Administrativo & Histórico-Científico do Museu Nacional, documents related to the material collected by J. B. Rodrigues in Amazonia, as well as others related to the A.S.N. Co., were located.

A list of the manuscript sources utilized in the work is given in the appropriate Section (Sources and References).

NOTES

1. Bertha Lutz (1894-1976) was a leading Brazilian scientist, who worked at the Museu Nacional, in Rio de Janeiro. Her main subject of study were the frogs of the family Hylidae.

2. Appart from the taxonomic literature (see Ewan, 1989), Trail's name is rarely referred to. The only citations of his name are those few which refer to him as a member of the expedition of the Amazon Steam Navigation Company (see, for example, Rodolfo Garcia, 1922).

3. REHSEIS is a french group of Research on Epistemology and History of Exact Science and Scientific Institutions of CNRS (National Center for Scientific Research).

4. For more details see Petitjean (1992).

5. Founded when Brazil was still United Kingdom of Portugal and Algarves, in 1818, the Museu Nacional became in the nineteenth century the major centre in Brazil for the study of its flora, fauna, geology, and paleontology.

6. A good account on the circumnavigation voyages of the late eighteenth and early nineteenth centuries is given by Brosse (1983).

CHAPTER 2. THE AMAZON STEAM NAVIGATION COMPANY AND THE EXPLORATION OF NINETEENTH-CENTURY AMAZONIA

2.1. Scientific versus commercial interests of the early explorers of Amazonia: a matter of interpretation

Following a rigid protectionist policy towards the Amazon region, Brazil kept the Amazon River and its tributaries closed to foreign navigation until the middle of the 19th century. Such policy was adopted way back in the early 17th century, when the Portuguese started to maintain the region under complete vigilance fearing invasions of foreign nations.[1] A well-known incident that illustrates the radical policy then in vigour refers to the closure of the Brazilian borders to the German scientist Friedrich Heinrich Alexander, Baron von Humboldt, and his companion, the French naturalist Aimé Jacques Goujand Bonpland, during their exploratory visit to the Spanish colonies of South America in 1799-1804. Regarding Humboldt as a virtual spy, the Portuguese crown sent orders to imprison him if he tried to enter into the Brazilian Amazonia (Humboldt, 1821: 369).

In 1808, the Portuguese court was transferred to Brazil, an event which introduced enlightened ideas into the colony and inaugurated a new era of commercial expansion through the opening of Brazilian coastal ports to foreign trade. Regardless of such a favourable scenario, however, all the large navigable rivers of Brazil, including the Amazon and its tributaries, cautiously remained closed to foreign navigation and commercial exploration. This condition persisted unchanged even when Brazil became

independent from Portugal in 1822, with the newly formed Imperial Government insisting upon the same rigid control over the region. It should be emphasized that the fear of foreign intrusions in the Amazon region was fully justifiable since, at the time, the Brazilian borders with its neighbouring countries were still not well established.[2] As a consequence, the Government wanted first to assure its sovereignty over the region - expressly through the definitive demarcation of its borders - before admitting any foreign venture. As stressed, in 1856, by the Brazilian foreign minister, José Maria Paranhos, to the U.S. diplomat in Rio de Janeiro, William Trousdale (Teixeira Soares, 1971:117):

> "... Brazil will not open the Amazon to world navigation before resolving the issues of its borders with the various countries of South America ... the whole region is in an unstable situation, and requires a defence force for its protection ... the Imperial Government is now determined to colonize the Amazon Valley and create a market for the exchange of products..."

The interest in the natural resources of the Amazon region grew considerably after the publication, in Europe, of the results of Humboldt's travels in South America (Humboldt and Bonpland, 1805-1837). The natural history collections they took to Europe, as well as their narrative of the voyage, aroused the curiosity of European explorers and men of science towards the Amazon region. As a result, the vast portion which comprises the Brazilian Amazon, especially because of the impediment imposed to its penetration for such a long time, became a focus of interest and nourished in the explorers a redoubled wish to visit it.[3] As the Bavarian naturalist Karl Friedrich Philipp von Martius commented during his voyage throughout Brazil in 1817-20)[4], after receiving a permission from the Portuguese Crown to explore the Brazilian portion of Amazonia (Spix and Martius, 1981:77):

"A great and pleasant surprise waited for us in São Luis [Maranhão], with the news that ... [the King] had granted us a special permission to travel through the Province of Grão-Para [Amazonia], having sent us the indispensable letters of recommendation for such end ... Thus was finally accessible to us the most rich and marvelous nature which lies under the equatorial sun ...".

In spite of having kept the Amazon region closed to foreign enterprises until 1867 - the year in which the Amazon River was finally declared open to ships of all flags - the Brazilians had started to allow foreign scientists and explorers to travel throughout the region since the early 19th century for surveying its natural resources.[5] From that time on, therefore, a number of explorers, such as geographers and naturalists - particularly Germans, British, and Americans -, started to visit the Brazilian portion of Amazonia. Backed by official governments or patrons, or eventually on their own expenses, these foreign scientists had such freedom of operation that even the dispatch of specimens, and the passing of otherwise strategic information to their governments, was freely allowed.

A major consequence of these early 19th century travels in the Brazilian portion of Amazonia was the building up, in museums and botanic gardens of Europe and the U.S., of the first collections of botanical, zoological and ethnographical materials from the region. The extraordinary biodiversity of Amazonia, uncovered through the study of those early natural history collections (as the one of H. Bates), provoked the emergence of innovative concepts which influenced the formulation of new theories - including the Bates' work on insect mimicry (1859), and the theory of evolution by Darwin and Wallace (1858) -, and yielded decisive data for far more refined interpretations of the distribution of animal and plant life on earth (Wallace, 1876).

It is beyond doubt that the work of foreign naturalists in Amazonia greatly contributed to the development of science as a whole, and especially to expand notably the knowledge of the exuberant natural history and ethnography of the region. It should be emphasized, however, that most travellers and scientists invariably visited Amazonia with other aims than those purely scientific. It is known, for instance, that many of them were instructed beforehand by their governments to investigate the potentialities of the region contemplating the exploitation of its natural resources. Actually, even those explorers who travelled with no formal investigative contracts, also provided indirect, though similarly strategic, information through their enthusiastic reports and travel narratives, which invariably exalted the vast natural resources of the region.

In principle, most foreign explorers who travelled in Amazonia - an heterogeneous assembly which included individual travellers and adventurers, true naturalists, and even pretence "scientific" commissions - contributed to the rise of foreign ambitions in the region. The American William H. Edwards who, in 1846, descended the Amazon River from Belém to Manaus, well typifies the explorer who went to the region without any formal contracts with scientific institutions or governments but who, nevertheless, was capable of greatly influencing governments (like his own) and persons (such as Alfred Russel Wallace) through his enthusiastic comments about the region. In his travel book, Edwards gave an stimulating descripiton of the Amazon region, commenting on the "exhaustless fertility" of the soil and the healthy conditions of the place. As he saw it, Brazil could surpass the U.S. in every market of the world, since the products then cultivated at both countries could well be raised in Amazonia "in inexhaustible quantities" (Edwards, 1847).

" The country of Amazon is the garden of the world, possessing every requisite for a vast population and an extended commerce. It is, also, one of the healthiest of regions; and thousands who annually die of diseases incident to the climates of the North, might here find health and long life."

Another traveller who contributed to the publicizing of the region's natural potentialities was the British botanist Richard Spruce, who travelled in Brazilian Amazonia between 1849 and 1855 financed by subscribers from Britain and other countries. Spruce was assigned to send botanical material of all sort to the emminent British botanist George Bentham, of Kew Gardens, who was elected as the first to study the material and later forward duplicates of the specimens to the other supporters. Commenting on Spruce's accomplishments, Bentham not only praised the huge collections made, but also highlighted the valuable information given by his collector on the economic uses of the Amazonian plants (Wallace *in* Spruce, 1908: XIV).

It should be noted that the Brazilian Government was aware of Britain's economic interests in the Amazon region, particularly of the role being played by the Royal Botanical Gardens, Kew in relation to species with economic value (see Chapter 4). Such awareness is well illustrated in a letter sent by the German naturalist, K. F. von Martius, to the Imperial House of Brazil[6] in 1861, in which he calls attention to the fact that Britain had sent three naturalists to Peru in order to get cinchona seeds to be introduced in its colonies of India and Jamaica. Martius stressed that the central idea behind this move was Britain's ambition of becoming the major supplier of quinine in the international market. In view of that, Martius recommended that Brazil should give incentive to the culture of cinchona in its territory so as not to have to buy it from the British in he future.

Besides Spruce, other British travellers and naturalists also exalted the potentialities of the region, in either romantic or more pragmatic (i.e. commercial) fashions. The naturalist Alfred Russel Wallace, for instance, when in a voyage to the region in 1847-1851 to collect specimens, acclaimed the favourable nature and climate of the region, having even envisioned joining together with some friends to transform the region into what he thought of as a "terrestrial Paradise, with beautiful grassland and orchards":

"When one considers the excessively small amount of labour required in this country, to convert the virgin forest into green meadows and fertile plantations, I almost long to come over with half-a-dozen friends, disposed to work, and enjoy the country; and show the inhabitants how soon an earthly Paradise might be created, which they had never even conceived capable of existing. It is a vulgar error, copied and repeated from one book to another, that in the tropics the luxuriance of the vegetation overpowers the efforts of man. Just the reverse is the case: nature and the climate are nowhere so favourable to the labourer, and I fearlessly assert, that here, the "primeval" forest can be convert into rich pasture and meadow land, into cultivated fields, gardens and orchards, containing every variety of products, with half the labour..." (Wallace, 1895: 230).

A commision sent to Amazonia in 1851 by the U.S., well illustrates the usual strategy of foreign countries - the U.S. in particular - for surveying the region aiming its exploitation. Disguised as a scientific mission to the Amazon valley, the Americans were actually after strategic information on the exploitable natural resources of the region. Such tactic is evident in the orders passed to Lieutenant W. Herndon, of the American squadron on the Pacific, and the Passed Midshipman L. Gibbon, which read:

" The government desires to be put in possession of certain information relating to the valley of the river Amazon. ...its capacities for cultivation and to the character and extent of its undeveloped commercial resources..." (Herndon, 1853: 7).

James William Trail - whose unpublished diary is reviewed in Chapter 3 - himself witnessed, in 1874, the arrival of foreigners in Amazonia attempting to explore the assumed natural wealth of the region, a resource recurrently exalted by earlier travellers:

" We had the visit from a young fellow Thicke who came out in the Lilian [a steamship sailing regularly from Liverpool to Manaus]. He is brother of the principal shareholders in the direct line of steamers, & is himself a shareholder, & has come in the belief that money is to be picked up everywhere here. Partly owing to the representations of Amorim, the originator of the Company, & partly to the statments in Bates' & Orton's book about the wonderful fertility of the country ..." (Ms 852:231)

Considering the public knowledge of the potentialities of the Amazon region, a view essentially built by the accounts of the voyagers who visited it, a question must be raised: was the Brazilian Government policy for preserving the region truly efficient against international ambitions? The free access to the region given to scientists and foreign travellers not involved with commercial activities, all of whom were free to take samples of all sorts, did nothing more than add further to the exposure of the natural resources of the region and to the growing of international pressure for exploring them.[7]

As a rule, whenever the Brazilian Government had previous knowledge (usually through its diplomatic service) of the commercial intentions of the traveller or expedition (such as the case of the Herndon and Gibbon Expediton mentioned above), or when any distrust of the applicant was felt, measures were taken to make access to the region difficult. As noted by the American rubber trader T. M. Everitt, who went to Belém in 1850 to buy rubber, it was rather difficult to obtain a visa from the Brazilian Government to go to Amazonia "for everyone suspected of going there with commercial objectives"

(Weistein, 1993: 83). The Herndon and Gibbon Expedition, even though indicated as "scientific", also suffered objections from the Brazilian Government before leaving the U.S. for Amazonia. This happened, however, because the Brazilians had already heard of its unrevealed commercial nature. In the end, pressured by the U.S. Government - which insisted in the scientific aims of the expedition -, the Brazilian Government had no way of impeding the entrance of the two American officers in Amazonia.

The occurrences above, however, were not restricted to the Europeans and Americans alone, since the neighbouring Spanish-American countries were also viewed with suspicion. An episode which motivated diplomatic complaints from the Venezuelan Government occurred in 1855.[8] During an exploratory mission to the upper Orinoco and Rio Negro, the Venezuelan agent Michelena y Rójas sailed down the Negro to the city of Manaus (the capital of the Amazon Province), where he asked permission to sail up the Rio Japura (a tributary of the upper Amazon). Even though he was officially backed by the Government of Venezuela, the authorization was denied by the suspicious Brazilian Government. In his travel book, Michelena y Rójas reported:

" ...he [the President of the Amazon Province] has not given me permission to explore, having stated that he has orders to not allow foreigners to explore the rivers of the [Brazilian] Empire". (Michelenas y Rojas, 1867: 391)

Similarly to the Americans, Michelena y Rojas was an eager advocate of the opening of the Amazon River basin to foreign navigation and international commerce,

and blamed the Brazilian Government for the state of abandon the region was relegated to at the time (*ibid*: 1867).

In essence, the Brazilian restrictive policy towards foreign navigation and commerce in the Amazon region is understandable. Since its independence from Portugal in 1822, Brazil went through turbulent times, with a series of provincial revolts bursting throughout the country[9] These separatist outbreaks only came to an end in 1850, when a series of parlamentary acts (such as the end of the slave trade; the land and immigration act; and the creation of a Commercial Code) brought internal peace and political stability (Bethell and Carvalho, 1989).

As for the Brazilian Amazon region, the scenario of political instability mentioned above was also stage for a most bloody rebellion in 1835-36: the "Cabanagem". Harshly repressed by the Imperial Government, the revolt is said to have provoked no less than 30,000 deaths. Actually, the last vestige of the uprising (which had spread throughout the Lower Amazon to as far as the city of Manaus) was only eradicated in 1840, when the Government granted amnesty to its participants (Souza, 1994: 123).

Strongly concerned with ensuring the national unity and sovereignity of the country, the Brazilian Government resisted, for as long as it found diplomatically convenient, all international pressures for opening the Amazon region to foreign enterprises. Conscious of the strategic position of the Great River, and the richness of the natural resources of the region, the Government needed first to implement a few vital measures for establishing its full control over the region. Such measures, which were put into practice after 1850, included: the decentralization of the commercial centre of the region (which was meant to include, besides Belém, the city of Manaus); the

settlement of boundary questions with its neighbouring Amazonian countries; and the foundation of settlements at strategic locations throughout the region.

NOTES

1. In 1616, fearing the settlements already established at the Lower Amazon by the Irish, English and Dutch, Portugal decided to block the access to the river from the Atlantic by constructing an outpost (the first) in the region: Forte Presépio. Only after doing so, the Portuguese succeeded in eradicating all foreign outposts from the area. To consolidate sovereignty over the whole territory, however, some suplementary actions were taken: in 1637, an expedition (with Pedro Teixeira in command) was sent up the Amazon River to Peru to survey the whole course of the river; in addition, religious missions were established along the margins of the Amazon and its tributaries. For additional details on the subject, see Lorimer (1989) and Smith (1990).

2. In the 18th century, when Brazil was still a colony, Portugal and Spain attempted to negotiate their boundary disputes through the treaties of Madrid, in 1750, and San Idelfonso, in 1780. Due to the failure of both treaties, however, the concept of the "utis possidetis" was the practice followed. As a consequence, only after the independence of Brazil and the Spanish colonies in South America, the boundary disputes between the (now) various countries started to be gradually settled.

3. The natural history of the Lower Amazon region and tributaries had already been surveyed by two Portuguese scientific/boundary commisions, sent to the region in 1753 and 1783. The latter of these, known today as the Alexandre Rodrigues Ferreira Expedition, spent 9 years in the region and left relevant collections and copious documentation on both the natural history and ethnography of the region. Due, however, to the protectionist policy of Portugal towards Amazonia, the results of the two expeditions were not divulged, thus depriving the scientific world of the time of such novel information. For additional details on both expeditions, see: Adonias (1986), Meira Filho (1976), and Pires-O'Brien (1993).

4. The Bavarians Karl Friedrich Philipp von Martius and Johann Baptist von Spix, came to Brazil with the scientific commission which accompanied the Austrian Archduchess Leopoldina of Habsburg, bride of the Portuguese Prince Pedro de Alcântara (who was later to become the first Emperor of Brazil). The scientists above were the first to receive special permission to work in the Amazon region after the transfer of the Portuguese Court to Brazil in 1808.

5. Before the Bavarian naturalists of the Empress' entourage, the only permission ever granted to a foreigner to explore the Brazilian portion of Amazonia was the one given to the German collector, Friedrich Wilhelm Sieber (see Sub-chapter 1.5)

6. In his letter Martius wrote: " Peckolt [Theodore Peckolt, a German pharmacist who lived in Brazil] is a very bright and hard-working man, and I very much regreet that his interest in the culture of cinchona has not met the Brazilian Government's attention. Brazil, no doubt, is the country presenting the most suitable conditions for the cultivation of these medicinal trees, but if plantations are not incentivated, the country will have to buy quinine from the British. They [the British] have now sent three naturalists to Peru to collect seeds and trees to grow in India and Jamaica ..." (Martius' unpublished letter, deposited at the Museu Imperial, Petropolis, Brazil - Doc. 7044 M-144). The three naturalists referred to by Martius were Richard Spruce, who left the Brazilian Amazonia to Peru in 1855 and was later ordered to locally obtain seeds of cinchona; the other two were probably Robert Cross, a gardener from Kew, and Clements Markham, a junior clerk in the India Office at the time (Brockway, 1979: 113).

7. Reis (1972), who analyzed the activities of some 19th Century travellers who visited Brazilian Amazonia, has also called attention to the separatist views included in their travel narratives.

8. Brasil had been in negotiations with Venezuela to delimit their borders since 1841, but a treaty settling the matter was only signed in 1859. At this same time, an agreement was also settled between the two countries for regulating navigation in the Amazon River basin. For more details, see Teixeira Soares (1972).

9. For information on the major revolts which took place in Imperial Brazil, see Bethell (1989).

2.2. The opening of the Amazon River to foreign navigation: the end of an epoch

When, in 1853, the U. S. Secretary of State, Mr. William Marcy, wrote to his diplomatic emissary in Quito, Ecuador, about the intransigent policy followed by the Brazilian Government of excluding foreign commerce "from all access to the Pacific Republics through the waters of this South American inland highway" (Teixeira Soares, 1971:83), he was only echoing a series of protests of his countrymen and seeking to compel the Spanish-American republics to take stronger actions forcing Brazil to open the Amazon to foreign commerce.

In their efforts to persuade the Brazilian Government of the importance of the Amazonian region to international navigation, the U.S., inspired by the Monroe doctrine,[1] even proposed a convention through which the Brazilian coffee would enter the U. S. free of taxes in exchange for the free navigation of the Amazon River by American citizens (Teixeira Soares, 1971: 112).

It should be mentioned that, since the first decades of the 19th century, the Amazonian countries bordering Brazil (all of them already sovereign republics at the time) had been putting diplomatic pressure on the Brazilian Government to open the whole of the Amazon River to free navigation, a motion fully backed by the U. S. and Britain. At the time, the Amazon represented the shortest way to transport products from most of these countries to the Atlantic, and Brazil, due to its policy of maintaining the river closed to foreign navigation, represented a great obstacle to international interests in the region.

A factor that added significantly to the disseminatation of the notion that the Amazon River should be opened to free international navigation was the view expressed in the reports of the exploratory expeditions (mainly geographic) which started to cross the Amazon River, coming from the Andes, at the early 19th century. The results of such expeditions, with no exceptions, re-affirmed the importance of the Amazon River as the main route to the Atlantic, and stressed the conviction that the whole region would experience a great development if Brazil would open the river to international navigation. Sharing such views was lieutenant Henry Lister Maw, of the Royal Navy, who descended the Amazon from Peru to Pará in 1827-28 and stressed on his report:

" I am persuaded that, if the navigation of steamers in the Amazon and its tributaries is initiated, the effect produced would be nearly magic, and I am sure that in 10 years time, the traveller crossing the country would not see it as he does today." (Maw, 1831: 297).

In 1834-35, two other lieutenants of the Royal Navy, W. Smyth and M.F. Lowe, jointly descended the Amazon river and re-affirmed the convenience of a navigable communication between the uppper Amazon and the Atlantic (Smyth & Lowe, 1836). Later, in 1847, while in Tabatinga waiting for a permit to enter the Brazilian portion of Amazonia, and also criticizing the Brazilian restrictive policy towards Amazonia, the Italian explorer Gaetano Osculati indignantly reported:

" ... a ridiculous Brazilian law prohibits foreign canoes coming from Peru, Nova Granada and Ecuador to enter Brazil; in such way, instead of facilitating the means of communication between these scarcely visited countries and improve their commerce, an array of most frivolous excuses are used to impede the entrance of travellers" (Osculati *in* Isenburg, 1991: 140).

In view of a steadly growing international pressure, the Brazilian Imperial Government,[2] supported by a newly created Commercial Code (see subchapter 2.1), decided in 1850 to implement a few important measures which later turned out to be decisive to the development of the Amazon region. Most important were the creation of the Amazon Province, with the city of Manaus as its capital, and the founding of the National Navigation Company (Companhia de Navegação do Amazonas), which was to ply the Great River and its tributaries. To implement such acts, the Government wisely gave the monopoly of navigation of the Amazon to a Brazilian company, which was founded precisely with this purpose in 1852, through the initiative of the Brazilian entrepreneur Irineu Evangelista de Souza. Twenty years later, this Company gave origin to the British Amazon Steam Ship Company, an episode which will be discussed in length in Sub-chapter 2.3.

At about the same time, the Brazilian Government established a Treaty of Limits with Peru, by which the two countries settled their borders and established a partnership for the navigation of the Peruvian Amazon. Chaumeil (1992: 358), however, considered that Peru paid a high price for navigating the Amazon, since it lost a considerable part of its territory to Brazil by signing this particular treaty.

It is worth mentioning that Brazil had the intention of exploring Peru's natural resources in the same way other imperialistic countries were already doing. This became apparent by the time of the inaugural trip of the Brazilian steamship *Marajó,* which sailed from Manaus, in Brazil, to the Peruvian village of Nauta. During the trip, mineral samples were collected at Iquitos (Rio Marañon, Peru) by a Brazilian engineer (Major Florestan Rozwadowski), who forwarded the material for analysis of its

combustible properties to the Brazilian National Museum (Museu Nacional) in Rio de Janeiro.[3]

Even though the rights of navigation of the Amazon had been given exclusively to a Brazilian company, the simple announcement of the opening of the river encouraged the U. S. to send an exploring commission to the region. The report of this commission - the Herndon and Gibbon Expedition (see Sub-chapter 2.1) -, when submitted to the American Congress in 1853, however, reinforced the aspirations of lieutenant M. F. Maury (then the head of the U.S. Naval Observatory and Hydrographic Office) towards opening the Amazon to U. S. ships. To defend his views of an American supremacy in the region, Maury published in 1853, under the pseudonym Inca, a condensed series of articles in the "Washington National Intelligencer & Union" through which he intended to weaken the Brazilian policy for the region. To support his ideas, besides the reports of the U. S. Lieutenants Herndon and Gibbon, Maury used the impressions of Francis Louis de Laporte de Castelnau, a French explorer who visited the Amazon region in 1847 after travelling through the hintherland of Brazil, Bolivia and Peru. The credibility and prestige of Castelnau, - one of the founders of the French Entomological Society and former leader of an important scientific expedition to South America[4] sponsored by the King of France, Louis Philippe -, represented reputable support to Maury's ideas.[5] Most significant is the following part of Castelnau's travel narratives (Castelnau, 1850-57) translated and published by Maury: "... the vast basin of the Amazon, which is destined to play a grand part in the future history of America ... the utter neglect of this river-basin by the nations of Europe will one day greatly astonish the political and commercial world". (Castelnau *in* Maury, 1853).

Besides Maury's protests, the Americans also stressed, through diplomatic channels, their dissatisfaction with the decision of the Brazilian government of giving the monopoly of the navigation of the Amazon to a native company. Since, however, the Imperial Government persisted with its same protectionist line, the Americans, joined after 1860 by some dissatisfied Brazilian politicians and entrepreneurs,[6] re-assumed their challenge against the Brazilian policy for Amazonia. An effective way of doing so was through U.S. diplomatic missions to Bolivia, Ecuador and Peru, which were sent to negotiate the free navigation of the upper tributaries of the Amazon. Such missions soon started to yield positive results, and several concessions were granted to American business enterprises in these Andean countries.[7]

Eventually, after several rounds of diplomatic negotiations with neighbouring countries, which included a border treaty with Bolivia in 1866, and talks with Colombia and Venezuela, the Imperial Government of Brazil finally decided to open the Amazon River to international navigation, which it did in 7th September 1867 ordained by a Decree of 7th December 1866.[8]

Although the Americans had a most active role in the process of the opening of the Amazon River to foreign navigation, it was the British, nevertheless, who once again[9] had the privilege of being chosen by the Brazilians as their preferential business partners. As a result, the first regular transatlantic line to serve Manaus was run by the British.[10] In addition, the already established Brazilian navigation company in Amazonia, which served Brazil and Peru, was also transferred to British hands in 1872.

NOTES

1. "America to the Americans" - a doctrine created by the U.S. President James Monroe in 1823, aimed at banning European interferences in American affairs.

2. It should be stressed that the leading countries to put pressure on Brazil were the Andean countries and the U.S., followed by the British.

3. Manuscript deposited at the Archives of the Museu Nacional, Rio de Janeiro (AAHCMN, Doc. 87, Pasta 4, 1853).

4. Members of the expedition were: Eugêne d'Osery, a mine engineer; Hugh Algerson Weddel, a Briton who had studied botany with Adrien and Jussieu in France; and Emile Douville, an employee of the Muséum National d'Histoire Naturelle, in Paris. For more information on Castelnau's expedition, see Papavero (1971).

5. Also largely alluded to by Brazilian politicians in favour of the opening of the Amazon was the report of the 1865 Brazilian expedition of the Swiss-American Louis Agassiz, who associated the development of the Brazilian Amazon region with the opening of the Great River to foreign navigation (Agassiz and Agassiz, 1975: 298).

6. Mainly by the liberal polititian Aureliano Cândido Tavares Bastos, who was one of the most eager defenders of the American views regarding the development of the region.

7. For details on the American - Brazilian affairs relating to the opening of the Amazon River, see Saboia de Medeiros (1938). For the boundary questions between Brazil and the Andean countries and the Guianas, see Teixeira Soares (1971; 1972) and Reis (1944; 1972).

8. A rather decisive move towards a more liberal policy for Amazonia was caused by an unanticipated political event which affected the Brazilian Government in 1864. An international crisis involving Brazil and its southern neighbours (Uruguay and Argentina) developed into a five years war with Paráguay. The imperialistic terms of the treaty signed between Brazil, Uruguay and Argentina in 1865, all of which had joined forces against Paraguay, provoked protests of other South American countries. Among other issues, they questioned the protectionist position of Brazil in relation to the Amazon River. For additional details on this affair, see Teixiera Soares (1971); for information on the political, economic and social changes which occurred in 19th Century Brazil, see Bethell (1989).

9. Since the transfer of the Portuguese Court to Brazil in 1808, and throughout most of the 19th century, the British had priority for establishing or participating in business enterprises in the country. For a good resumé on the British commercial alliances with Brazil, see Graham (1969).

10. The first transatlantic line was established by the Portuguese entrepreneur Alexandre Amorim who, with British capital, founded the Liverpool and Amazon Mail Steam Ship Co. Ltd. in 1875. The company, however, was short-lived, having closed in 1876. A second company, the Red Cross Line, was also founded with British funds in 1877. For more details on the early foreign navigation companies which operated in Amazonia, see Bittencourt (1977).

2.3. The Amazon Steam Navigation Company: a British enterprise in nineteenth-century Amazonia

On 3rd May 1872, in London, the President of the Brazilian "Companhia de Navegação do Amazonas", Irineu Evangelista de Souza, the Baron (later Viscount) of Mauá, transferred the rights and obligations of his navigation company to five British businessmen, who founded a company exclusivelly to incorporate the enterprise. The new company, called "Amazon Steam Navigation Company", incorporated all the properties belonging to the original firm, which included some 990,340 acres of land in the Amazon region. It also secured the rights of continuing to receive the subsidies assigned to the old company by the Brazilian Government (see Appendix I). It should be emphasized that this new Company symbolized, after only five years of the opening of the Amazon River, an unprecedented step regarding international affairs (commerce in particular) in relation to the Brazilian Amazon region. Indeed, it represented the first foreign investment in the region fully supported and subsidized by the Brazilian Government.

If one considers the rigid nationalistic policy followed by the Brazilians in relation to foreign enterprises in the Amazon region (see Sub-chapters 2.1 and 2.2 above), the conditions by which the Companhia de Navegação do Amazonas was handed over to the British businessmen by the Baron of Mauá may look rather surprising. In an apparently drastic move, Mauá passed to foreign hands not only the business itself, but also the privileges he had obtained for his enterprise from the Brazilian Government.

To understand Mauá's move, however, one must go back to 1852, the time when the Companhia de Navegação do Amazonas was founded through Mauá's initiative. By

that time, the Brazilian Government was concerned in consolidating its sovereignty over its portion of Amazonia (see Sub-chapter 2.2 above), which it intended through the colonization and development of the upper reaches of the Brazilian Amazon and its tributaries. To achieve such an objective, the Government granted incentives to Mauá's enterprise, which included substantial subsidies and the grant of lands to be colonized and explored. Following the guidelines established in the contracts[1], Mauá founded two colonies in the Lower Amazon, in which he settled 1,061 Portuguese and 30 Chinese from Macao.[2] Since the enterprise, however, brougth no financial return to the Company, three years later Mauá obtained from the Imperial Government the cancellation the obligations for colonizing the Company's territory. The Company was allowed to keep, however, all the land granted for the colonization projects.[3]

By the mid 1860's, however, a serious financial problem, which ended by bankrupting the Brazilian entrepeneur,[4] forced him to negotiate two of his enterprises with the British: a natural gas company, and the Companhia de Navegação do Amazonas. The sell out of the Navigation Company was made possible through a Decree of the Imperial Princess Regent, signed in 7th June 1871, which conceded to the Baron of Mauá authority to transfer to a foreign company all rights and obligations of his Companhia de Navegação do Amazonas (see Appendix I).

Mauá's preference for British partners was not new. As pointed out by Graham (1969: 31), the Baron was a typical anglophile, who utterly believed in the benefits of English investments to the development of Brazil. Such view may be explained by the fact that he was a self-made man, who started his working life at 17, in an English establishment at Rio de Janeiro. Having later become a partner of his English boss, to

whom he became forever grateful, Mauá developed the notion that England, and Englishmen, represented standards of prosperity and progress.[5]

For the British, the acquisition of the Companhia de Navegação do Amazonas, with all its lands and benefits, was an extremely worthwhile negotiation. The Amazon region was considered at the time a very promising territory, where a flourishing commerce of rubber was nearing its peak. Furthermore, the local natural resources were still mainly unexploited, and the Brazilian Government was encouraging immigration to the region in order to develop it.

In 16th July 1873, about a year after its formation, the Amazon Steam Navigation Company obtained permission from the Brazilian Government to explore coal at Parintins, at the Lower Amazon, and in Mojú, near Belém (Leonardos, 1970: 293). Motivated by the mineral potential of its lands, the Company decided to organize an exploratory expedition to survey its territory at once. In this way, during the first ordinary meeting of the Company, held in London in June 1873, it was reported that:

" ... with a view to examine and utilize the very large and valuable landed property belonging to the Company, the Board proposes at an early date to send an experienced geologist to that district, where there are indications of the existence of minerals which may prove of great importance to the future investments of this company". (A.S.N.C. report of the Ordinary General Meeting, 18th June 1873)

Subsequently, during the second ordinary meeting of the Company, held in June 1874, it was reported that:

"In accordance with the intimation given last year, the Directors have dispatched an expedition to Brazil to survey the various landed properties belonging to the Company. The expedition is under the direction of Mr. C. Barrington Brown, a gentleman widely known for his geological researches... The reports which have reached the Board hitherto relate chiefly to lands suitable for pastoral and agricultural purposes, and justify the belief that

hereafter the various plots may be turned to profitable account..." (A.S.N.C. report of the Ordinary General Meeting, 3rd June 1974).

The consummation of the expedition, and the future use of its results, was reported during the third ordinary meeting of the Company, held in June, 1875:

" ...with a view to future operations of this nature, and in order to obtain a complete survey of the large territories, amounting to about one million acres, which the Company possess in the Amazonian region, and which should hereafter form the sites of important colonies, the Board, as the Shareholders were last year informed, sent out a commission ... have now completed their work. The directors hope that the results will prove of great value to the general interest of Brazil... ". (A.S.N.C. report of the Ordinary General Meeting, 30th June 1875)

Even knowing that the agreement between the former Companhia de Navegação do Amazonas and the Imperial Government for the colonization of the region was no longer valid, the newly formed British company still utilized issues such as immigration and colonization for negotiating subsidies with the Brazilian Government. In an official letter to the Imperial Government in 1877, the Company requested the maintainance of official subsidies to its enterprises by stressing that:

"...without working hands it will not be possible to increase the production of the Amazon valley. The colonization is mandatory". (A.S.N.C. petition, 1877)

The British Company was never able to put forward its plans regarding immigration to the Amazon region, mainly because of the inumerous bureaucratic obstacles imposed by the Brazilian Government.[6] In any case, the Company's rights over its lands were to expire in ten years time, an unfavourable perspective for a long

term investment such as a colonization project. A much more profitable business, which allowed immediate revenue - the rubber commerce -, was in great expansion throughout the region at the time. With its modern fleet, and the subsidies provided by the Brazilian Government, the Company shortly turned into a powerful and profitable enterprise which prospered during the Amazonian rubber cycle, a period which lasted from the late 1870's to the mid 1910's. According to Weistein (1993: 82), the Amazon Steam Navigation Company represented indeed a most important symbol of foreign penetration in the rubber economy of Amazonia.

In 1911, still in British hands, the Company established a new contract with the Brazilian Government, and changed its name to "Amazon River Navigation Company". Shortly after, however, it turned into an uninteresting business due to the collapse of the Brazilian rubber monopoly, and the bureaucratic obstacles imposed by the Government to continue to provide subsidies for its functioning. Finally, in 1924, the Company decided upon voluntary liquidation, and was sold to the Brazilian Government, which turned it into a regional navigation service which still exists today as the "Serviços de Navegação da Amazônia e Administração do Porto do Pará".

NOTES

1. See Decree 1037, of 30th August 1852, and Contract of 2nd October 1854.

2. One of the colonies founded by Mauá was visited in 1859 by the German physicist Robert Avé-Lallemant. Located near Serpa, a village on the right bank of the Amazon River, the colony was, at that time of Avé-Lallemant's visit, a thriving industrial colony dedicated mostly to brickwork and timber activities. Avé-Lallemant commented that a German official and engineer, Moritz Becher, was responsible for the settlement. He also noted the presence of other German, English and North-American engineers besides the Chinese workers of the colony. Deeply impressed by what he saw, he remarked - "there is progress here! there is Europe here!" (Avé-Lallemant, 1961: 204). Only fifteen years after the visit of the German physicist, however, nothing remained of the original colony. In 1874, the Scotch naturalist James William Trail visited the site and reported: - "The brickwork must have been of considerable size, but now only bits of the substantial brick walls are standing, through around it lie scattered heaps of rubbish, broken bricks & tiles, barrows, pieces of bellows, ironwork, etc., allowed to go to wreck" (Ms. 852: 95). Trail also visited a second colony founded by Mauá, the "Colonia de Mauá", located near Manaus. From it, however, he only found a "ricketty house and a cooking shed" (Ms 852: 232). As a whole, all attempts by the Brazilian Government to introduce foreign settlers to Amazonia failed, as will be seen in Sub-chapter 3.1.

3. See Contract of 10th October 1857, page 11, Paragraph 21st, which cancels the Company's obligations regarding the colonization of its territories, and compensates it,with additional lands, for expenses previously assumed with the settlements already established.

4. See Caldeira (1995) for a detail analysis of Mauá as a businessman of the Brazilian Empire.

5. For a biographical sketch of Mauá, see Faria (1926) and Besouchet (1978).

6. Numerous were the problems confronted by new settlers in Amazonia, which ranged from the proper demarcation of their lands, to the lack of working hands and difficulties in importing machinery and other implements. For details on the early immigration to the Amazon region, see Marajó (1883) and Weinstein (1993).

2.4. The expedition of the Amazon Steam Navigation Company: the first authorized foreign survey of the exploitable natural resources of the Brazilian Amazon region

In the late 1860's, the Brazilian politician Tavares Bastos visited the Amazon Region to evaluate, among other things, the issues related to the navigation of the Amazon River. On this occasion, he noted that the then Brazilian "Companhia de Navegação do Amazonas" had contributed very little to the development of the region, having brought to it no social benefits whatsoever. He also stressed that the Company had not even taken the initiative of forming a commission tc carry out the exploration and charting of the tributaries of the Amazon (Tavares Bastos, 1937: 184).[1] As mentioned earlier, Tavares Bastos was a most active promoter of the opening of the Amazon River to foreign navigation, and his comments essentially reflect such convictions.

A prominent supporter of Tavares Bastos' liberal views towards Amazonia was the Swiss-American naturalist Louis Agassiz whom, in 1865, the Brazilian had the opportunity of escorting on a voyage up the Amazon on board a steamship of the "Companhia do Amazonas". For Agassiz, the principal strategy for attracting foreign investments and immigrants to the region should be the opening of the Amazon River to international navigation.[2]

Most Amazonian citizens agreed with Tavares Bastos' views, and actually desired that foreign colonization should be encouraged in the region.[3] Thus, when the newly formed British Amazon Steam Navigation Company set forth an expediton to survey the Amazon region for evaluating its potential for commercial exploitation, the

local citizens highly praised the initiative. For the Amazonians, the enterprise meant development, especially due to the arrival of foreign settlers and the consequent growth of the local commerce. As noted on a report presented by the President of the Province of Pará in 1875, when passing his post to a successor:

> "The Companhia de Navegação a Vapor do Amazonas ... has, at its own expenses, a scientific commission exploring the Valley of the Amazon ... The aim of the expedition is to collect relevant data in order to facilitate immigration, which the company wishes to promote to the river bank and its tributaries" (*Relatório da Província do Pará*, 1875: 69).

The members of the expedition of the Amazon Steam Navigation Company arrived in the Amazon region in September, 1873, with the "purpose of selecting and reporting upon certain territories, alloted to them by the Government of Brazil, on the banks of the Amazon and several of its tributaries" (Brown & Lidstone, 1878). The participants, the first Canadian and the others British, consisted of Charles Barrington Brown, geologist and leader of the expedition; William Lidstone, civil engineer and draughtsman; and James William Helenus Trail, botanist and medical adviser. Of the three, only C.B. Brown had previous experience in tropical regions, since he had worked before for the British Government in British Guyana (Brown, 1875). Because of his earlier work in the jungles of the region, he was named responsible for the expedition.

Making good use of the efficient logistic support provided by the Company - which included a steamboat put exclusively at their disposal -, the three men surveyed no less than 15,000 miles of the Amazon region (Brown & Lidstone, 1878). Their work, which lasted from October 1873 to March 1875, covered several places not yet explored as far as natural history was concerned.

The first 8 months of the expedition were spent surveying the lower Amazon River and its tributaries, for which the party set up bases at Monte Alegre, Prainha, Santarém, Obidos and Manaus. After spending nearly two months in Manaus waiting for a replacement steamboat, the group proceeded to explore the upper Amazon, having reached as far upriver as the Peruvian village of Canama, on the margin of the Javarí River. At this same occasion, the expedition surveyed the rivers Purús, Juruá and Jutaí (for the routes followed on this, and the other legs of the expedition, see Figure 1). A more detailed account of the voyage is given in Chapter 3.

The expedition was completed in 1875, when its members returned to Pará after a journey up the Jutaí river. On the occasion, a newspaper from Belém, the "Diario do Grão Pará", recorded the arrival of the expedition in that city, and praised the initiative of the Company in sending specialists to study the natural history of the region. The newspaper also emphasized that with the future publication of the expedition report, in different languages, the region would be better known in Europe facilitating, in this way, the problems with immigration so much needed for the development of the regiom. It also applauded the Baron of Mauá for having made possible such unique opportunity of expanding the knowledge on the region as a whole.[4]

Both the botanist J. Trail and the engineer W. Lidstone returned to England shortly after the end of the expedition.[5] The geologist C. Brown, however, spent two more months in Pará settling his final duties as leader of the expediton, after which he handed over the Company's final report of the expedition to Mr. Manoel Pimenta Bueno, the man in charge of the Company's interests in Belém.

Figure 1. Map of the Brazilian Amazon region, showing the routes of Trail's travels throughout the region.

The only part of the final report of the Company's expedition that ever became public was a concise section narrating the survey of the Jutaí River. This segment was handed over to the Brazilian Geographical Society by Francisco Pimenta Bueno,[6] and was published in the journal of that Society (Brown & Trail, 1886).

The interest of the Brazilian Geographical Society may be explained by the fact that, until that time, the report of the Company represented the only single source of available information on the topography of the area adjacent to the Jutaí River.[7]

The outcome of the expedition was somewhat frustrating regarding the Company's interests in Amazonia, since it failed to reveal any prospects for the immediate exploitation of the natural resources of the region. As far as foreign affairs is concerned, however, the expedition should be considered as a mark of the beginning of a new age regarding the navigation of the Amazon River and the foreign exploration of the region. This is because the Company's expedition was the first to enter the Brazilian Amazon with the specific aim of surveying its resources for commercial exploitation. And more: it was the first foreign company to have the complete approval of the Brazilian Government for that. After the Company's expedition, several foreign enterprises began operating in Amazonia, including (and principally) those involved with the boom of the rubber business.

Even though the expediton was not fully rewarding for the Company, it greatly contributed to the knowledge of the natural history of the Amazon region. Several botanical and zoological specimens were collected and sent to museums and botanic gardens in Britain. From a purely scientific perspective, the relative success of the expediton was particularly due to the work of the botanist J.H. Trail. Although the

geologist managed to collect some relevant fossil material (Brown, 1879 a; b), it was the young botanist (whose performance in the region will be reviewed in the next Chapters) who, at the very beginning of his career, foresaw the unique opportunity of building up a reputation as a naturalist by putting together a collection of specimens from locations never sampled before.

NOTES

1. In fact, the Companhia do Amazonas sent its engineers individually to investigate the navigability of the Amazon River and tributaries in the areas covered by its navigation lines. The reports produced by the engineers included observations on the natural resources of the areas they visited. (See Rozwadowski, 1854; Mattos, 1855).

2. Agassiz pointed out that, in contrast with the liberal policy recently introduced in Brazil, the Country still maintained the monopoly of the navigation of the Amazon River. He firmly believed that the only way to develop the region was precisely the adoption of a policy of free trade in the region, with the river opened to all nations. Agassiz & Agassiz (1975: 296-297).

3. When in Amazonia, Agassiz was asked by Mr. Pimenta Bueno (the Company's agent in Belém) about his views on foreign immigration to the region. Agassiz's replying letter to Pimenta Bueno stressed that the problems with foreign immigration to Amazonia were actually caused by the bureaucratic obstacles imposed by the Brazilian Government. This letter was later cited by the President of the Province of Pará as a supporting evidence that bureaucracy should be reduced in order to stimulate immigration to the Amazon region (see *Relatórios Provinciais* - Pará, 1875).

4. See Diário do Grão Pará of 22nd February 1875. Trail added in his diary a copy of the newspaper's note. (Ms. 853, p. 147).

5. Of the three members of the expedition, the only one who returned ill to England was the engineer W. Lidstone, who caught beriberi by the end of the expedition. This was the only serious case of illness among them. The botanist J. W. Trail reported in his diary that the Amazon region could be considered a healthy one, as long as some basic procedures were observed (Ms. 853, p. 171).

6. At the time, Francisco Pimenta Bueno (who was the brother of Manoel Pimenta Bueno, the Company's agent in Belém) was the new President of the Province of Amazonas, and a member of the "Sociedade de Geographia do Rio de Janeiro".

7. The only other reference on natural history collecting at the Jutaí River is that included in Agassiz's (Agassiz & Agassiz,1975: 132).

CHAPTER 3. JAMES WILLIAM HELENUS TRAIL'S TRAVELS IN NINETEENTH-CENTURY AMAZONIA

3.1. Who was he? A biographical outline

Born in 1851 at Orkney, an island off Scotland, James W.H. Trail[1] was the fifth and younger son of the Reverend Samuel Trail, Professor of General Systematic Theology at the University of Aberdeen. Descended from a traditional Scottish family linked to the clergy,[2] Trail was brought up immersed in family traditions and lived, until the age of 12, practically as the only child of the house since his brothers and only sister were all away studying at Aberdeen.

Trail's interest in natural history developed early in his childhood, during his walks to the moors and lochs of his home Orkney. On his autobiography[3] he recalled his first voyage abroad, which was made with his family to Germany in 1863, and during which he experienced the pleasure of going out with a friend to observe animal life and compare it with that he knew from his home island.

After leaving Orkney to Aberdeen to attend grammar school in 1864, Trail could only stay at the island during his vacations. In 1866, he enrolled at the University of Aberdeen and, in 1869, finally started his studies of natural sciences, and obtained a M.A. degree in 1870.

By the time Trail enrolled as a natural history student, he had already put together a reasonably good entomological collection and published two papers on the subject.[4]

At the time, he took the initiative of donating his insect collection to the Natural History Museum of the University, since the University's collection was smaller and less cared for than his own. Due to his visible fondness of the subject, the Curator of the University Museum, Prof. James Nicol, invited Trail to organize the Museum's collection. In this way, for nearly 4 years he worked at the Museum, being in charge of the zoological collection. As recalled by him in his autobiography (*Anonymous*, 1923: 21), the work at the Museum was of great value, since it introduced him to systematic zoology. The Museum had representative zoological collections from India and other countries, and to work them out with the aid of the bibliography of the University's Library was a great pleasure to him. During the time, he also used to assist the Professor of Botany, George Dickie, helping junior students during botanical excursions.

After Trail obtained a degree in Natural Sciences, his father began to put pressure on him to undertake a more stable career, as a clergyman for instance, and constantly questioned his inclination towards natural history by stressing that:

> "natural science would never help him to earn his salt, much less his livelihood".[5]

To compensate his father's frustration for not having become a clergyman, Trail went to a medical school in 1870. At the time, he got involved with the University's political affairs, having actually been appointed convener of Huxley's committee during a Rectorial election (*Anonymous*, *ibid.*: 26). Once again, however, Trail's father interfered in his affairs, forcing Trail to resign from his post after affirming his disaproval for a candidature of a man so "unorthodox" as Huxley.

By the middle of his medical course, Trail was recommended by two of his former natural history tutors - the botanist George Dickie and the professor of zoology James Nicol (also curator of the University's Museum) - to participate in an expedition to the Amazon region.[6] Such unexpected opportunity of travelling to Amazonia meant to the young Trail the materialization of his most remote expectations. As he states in his autobiography (*Anonymous*, *ibid.*: 22):

> "The Amazon Valley, from my boyhood, had taken a strong hold on my imagination; and I read every book about South America that I could procure from the University library and elsewhere; but I never thought it would be seen by me. I thought my best way to obtain the work I wished would be through the medical profession, though I hated even the sight of wounds and medical work of every kind...".

For Trail, a trip to a place such as Amazonia came as unique opportunity to build a career in natural history. He therefore eagerly accepted the invitation, and dedicated 1½ years of his life exploring the Brazilian Amazon region with the other members of the expedition.

During his stay in Amazonia, Trail wrote a diary, including in it observations on the habits of the people of the region (including Indians), the diseases, and principally on the natural history of the places visited.[7]

The collections of Amazonian animals and plants made by Trail and sent to scientific institutions around Britain, brought him recognition among the British scientific community, and were particularly helpful in consolidating his relationship with the prestigious Director of Kew Garden of the time, Dr (later Sir) Joseph Hooker.

As soon as Trail got back to Aberdeen, in 1875, he re-started his medical course, having graduated by the end of 1876. In the meantime, however, he began to work on

his collection of Amazonian palms, having published a paper describing several new species in the *Journal of Botany* in 1876 (xiv: 323-359). By that time, he was also invited to give a talk on his voyage at two Scottish institutions.[8]

In 1876, J. Hooker proposed Trail for a position as botanist at the colony of British Guyana[9]. By this time, however, Trail was involved with family matters,[10] and wrote to Dr. Hooker on 18th November declining the invitation, at least for the moment:

"At present family circumstances do not, and will not, permit me to leave the country before the end of this winter, and as I cannot hope that the situation you have so kindly recommended will remain vacant till that time I am compelled to relinguish all prospect of being able to accept it ..." (Appendix II, letter n0.14).

In 1877, Trail's lifetime opportunity arose: the chair of Botany at the University of Aberdeen became empty due to the retirement of Professor G. Dickie. So, in April 1877, Trail, who was only 26 then, was appointed Professor of Botany at the University of Aberdeen, a position he kept for the rest of his working days (Plate II a).

As soon as Trail was confirmed as Professor at the University of Aberdeen, he wrote to Hooker announcing his new post and definitely declining the job in British Guyana. In a letter of 27th March 1877, he wrote:

"I write in haste to let you know that I have just heard that I have been appointed to the Professorship of Botany here. I regret very much not having been able to come to a conclusion ... about the appointment in Georgetown, but I was very doubtful about my chances of success in Aberdeen..." (Appendix II, letter no. 15)

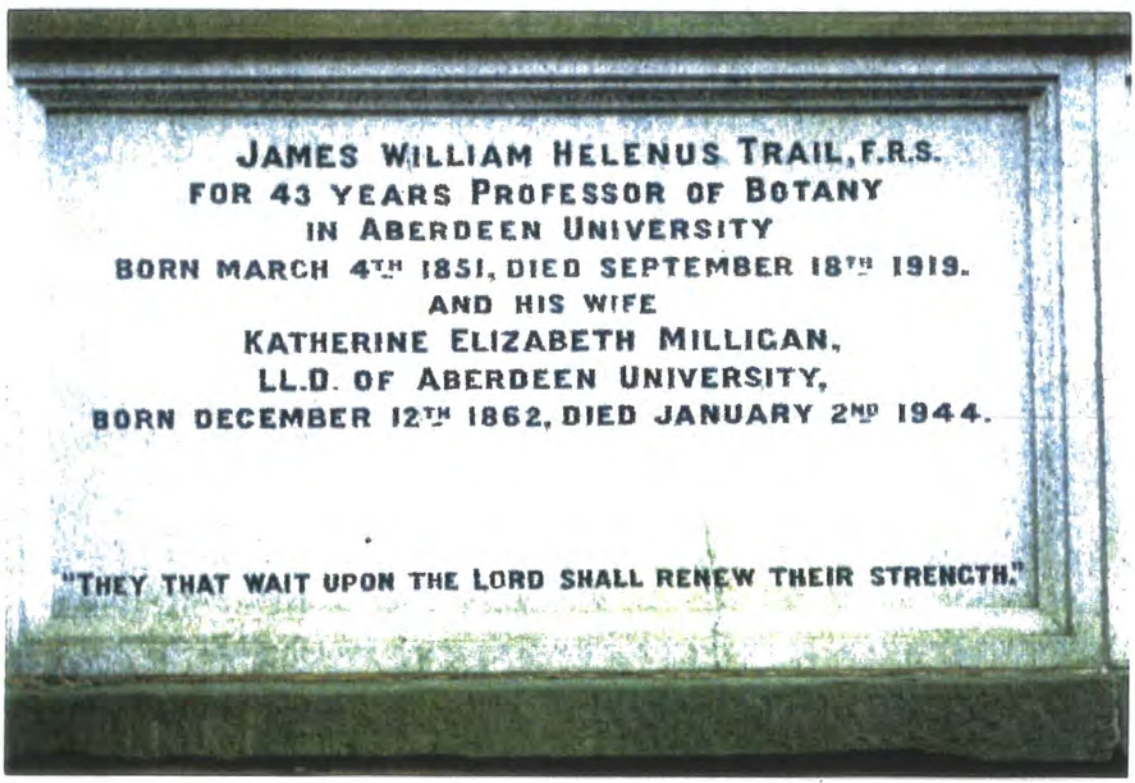


Plate II

a) Trail's house at the University of Aberdeen, where he died in 1919. Photo by M. R. Sá, 1990.

b) The tombstone of Trail and his wife , at St. Machar's Cathedral, Old Aberdeen. Photo by M. R. Sá, 1990.

Due to his early appointment to the University of Aberdeen, Trail was able to fulfil his professional ambitions very early in life. Indeed, in less than two years after his return from Amazonia, he was fortunate enough to be working with natural history at the university of his home town. His successful career, no doubt, was launched by the sudden reputation he built with his trip to the Amazon region, especially by the botanical and zoological collections he brought home to Britain.

Through the following years, Trail dedicated himself to expand the University's botanical department and library. He also took upon himself the task of promoting the natural history of Scotland, particularly among the Scots, for whom he created the Aberdeen Working Men's Natural History Society in 1886. From 1883 to 1892, he also functioned as editor of the *Scottish Naturalist* and, from 1892 to 1911, as the botanical editor of the *Annals of Scottish Natural History*. Besides his scientific work, especially on plant diseases - a field in which he became an expert (see Trail, 1888; 1906) -, Trail also took the initiative of promoting studies of natural history at the University of Aberdeen. Through his initiative, an University Botanic Garden - the "Cruickshank Botanic Garden" - was founded in 1901, having him also created in the following years prizes and funds to support distinguished students in zoology and botany. These were the Nicol prize in zoology , the Dickie prize in botany, and the Helen Scott Fund in memory of his mother. Trail also created a fund for the Library of the University of Aberdeen, and another to encourage research on Protoplasm through the Linnean Society of London.

Finally, at the age of 68 and still at his duties, a short illness took his life on 18th September 1919 (Plate II b).

After Trail's death, some scientific journals paid tribute to him, among which the text of his obituary in *Nature* Magazine (1919:104) is worth of note: - "Trail was thoroughly typical of Aberdeen, vigorous, self-reliant, with a strong sense of duty, and a touch of austerity in its performance".

The University of Aberdeen erected a memorial plate in Trail's honour at the Department of Botany. The plate depicts his preferred subjects of study (insects, spiders, aquatic plants) and shows Amazonian palms flanking them altogether. Inscribed on the memorial tablet are the words:

"He knew and loved the realm of living nature and inspired successive generations of students with his desire for deeper knowledge".

NOTES

1. Frequently Trail's family name is cited in the literature with a double "l". The confusion was originated by Trail himself, who occasionally signed his name as "Traill". This was probably due to the existence of two branches of the Scotch family Trail: one spelled with a single and the other with a double "l". J.W.H. Trail, however, is descendent of the single "l" branch. For more details on the origin of Trail's family name, see Anonymous, 1923 *J.W.H. Trail - Memorial Volume* and the manuscripts on Trail's ancestors deposited at the Aberdeen University Library. A recent study on Trail's family has been completed by Sheila Natusch.

2. The ancestors of Trail's father belonged to a family branch closely linked to the Church, with Trail's father himself being a clergyman. Trail's mother also came from a Scotch family associated with the clergy. For more information on Trail's genealogy, see Anonymous, *ibid.*: 2-9.

3. *Anonymous* - James W.H. Trail. *A Memorial Volume* (1923).

4. See *Entomologist's Monthly Magazine* (1868, v.49); *Entomologist* (1869, 4:197-200).

5. *Anonymous - ibid.*

6. His journals and catalogues of the Amazon trip are deposited at the Aberdeen University Library, Ms nos. 851, 852, 853.

7. Trail read a paper about his impressions at the Aberdeen Medical Association in 1875 (Ms. deposited at the Aberdeen University Library) and at the Perthshire Society of Natural Science (*Perths. Soc. Nat. Sci. Proc.*, 1886:7-8).

8. Coincidently, Kew also appointed for a post of colonial botanist another Scotish naturalist who had equally left Brazil a year earlier. He was George Gardner, who explored the hinterland of the country in 1836-41 (Leonardos, 1970: 142).

9. Trail does not mention, neither in his biography nor his diary, such "family circunstances".

10. A good résumé can be found in his obituary, published in the *Proc. Linn. Soc. London*, session 1919-1920: 49-51, and also in Stafleu & Cowan (1976)

3.2. Trail's journeys throughout Amazonia as recorded in his diary: a review of his notes and collecting activities

When the Scotch naturalist J. W. H. Trail arrived in Brazilian Amazonia in 1873, the region was just entering an era of development after centuries of restrictions imposed to foreign commerce and navigation. The main factor which launched such process was the growing international demand for rubber (from the 5,602 kg exported in 1870, the total grew to 8,291 kg in 1873)[1], which actually originated a rush for new collecting areas along the tributaries of the upper Amazon River, such as the Purús, Juruá, Jutaí and Javarí.

A fraction of these early times of change in Amazonia, which represent a most important chapter in the history of the exploration and occupation of the region, was witnessed by Trail during the 18 months he spent there. His travel diary, therefore, even if primarily concerned with natural history subjects, also includes invaluable records of the social changes occurring in the region at the time of his visit. Trail's commentaries on aspects such as: the beginning of the occupation of the tributaries of the upper Amazon (Solimões) by rubber tappers; the widespread movement of locals for collecting rubber; the isolated nucleus of "progress" detected at Santarém and Manaus; the still exercised, though officially banned, traffic and utilization of Indians as cheap labour; represent unique historical records of the late 19th century Amazonia.

As for Trail's observations on the natural history of Amazonia, they should be interpreted mainly as complementary to previous accounts of other naturalists who

visited the region before him, notably Bates in 1848-1859, Wallace in 1848-1852, and Spruce in 1849-1855.

As will be noted below, Trail's first impressions about the Amazon region were influenced by the negative impact he felt in relation to the rusticity of the region. Due to his pragmatism, he did not demonstrate, at first, much enthusiasm for what he saw, which contrasted with the first impressions of most foreign naturalists who had previously visited the region (see Chapter 2). Gradually, however, he became more tolerant and his enthusiasm steadly grew, especially after the working conditions were improved. The prospect of collecting in places not yet visited by other naturalists, such as the tributaries of the upper Amazon, also contributed to rise his motivation.

Trail's impressions of the social aspects and natural history of the Amazon region, condensed from his unpublished diary, are reviewed below in the context of their contribution both to the history of the region, and the advancement of the knowledge of Amazonian zoology and botany. In such perspective, the notes and commentaries were selected in accordance with their relevance, following the original chronological sequence of Trail's diary.

The adopted subdivision of the Amazon River into "lower" and "upper" courses is in accordance with a concept widely followed, by Trail among others. By "lower" Amazon is meant the course of the river extending from its mouth to its confluence with the Negro River; the "upper" Amazon, also referred to as "Solimões River", is the course upriver from the Negro.

The early days at Belém

The city of Belém, situated at the mouth of Guamá River by the Guajará Bay, was then, and still is today, the gateway to the interior of the Amazon region. From the beginning of the 19th century, the city started to receive a great influx of foreign travellers, numbers which increased considerably after the opening of the Amazon river to foreign navigation in 1867.

At the time of Trail's arrival in Belém, in 12th October 1873, several foreign firms were already established there. Surprised by the number of foreigners living in the city, and the variety of imported goods available for sale, he commented on his diary:

> "There are numerous shops in Pará (too many for its size), where one can buy about any kind of goods but much pay three or four times the price one would in England. There seems to be a great sale of preserved meats in tins, Moir's & Hogarth's goods being conspicuous. Aberdeen biscuits are also represented, one of the first objects that I saw in a shop today being a biscuit tin with a view of Balmoral on it". (Ms 851: 20).

Earlier in 1859, during a stop at Belém on his way back to England, Bates had already noticed the changes ocurring in the city at that time. Having sympathized with the city, he later commented in his book (Bates, 1969: 404-405) on the improvements being made to it, but regretted, nevertheless, the degradation of the its outskirts as a consequence of the so-called "progress".

In contrast to Bates, Trail had a poor impression of the city of Belém, like Wallace on his arrival in 1848 (Wallace, 1979: 19). The neglected look of the

buildings, streets and squares made a negative impact on both. In his diary, Trail wrote about the Belém as he saw it then:

> "The open places or squares are mostly overgrown with scrubby plants mixed with rubbish, ruts, stones, etc. ... the whole place has a weedy ruinous look, very different from what Bates last account of it would lead one to expect". (Ms 851: 19)

Trail and the other members of the expedition stayed in Belém from the 12th to 18th October 1873, while preparing for their trip upriver to survey the Company's lands. For their work while in the city, the Company put at their disposal an airy upper room in its office. Due to the lack of vacant rooms in the city's hotels, they chose to sleep in the Company's steamboat which was to take them upriver, and had their meals at the Hotel do Commercio. The days were spent preparing the voyage, in visits to places of interest, or in walks alongside the river banks to observe the fauna and flora.

A most significant place visited by Trail at the time was the Natural History Museum of Pará, which is the first natural history museum of Amazonia. The Museum, linked to the Public Library of Belém, was created in 1867 but only started to function in 1871 (Lopes, 1993: 217). After an uncertain start, it was nearly closed a few years after innauguration, but was restored and re-organized in 1881. From 1884 to 1907, it had as Director the Swiss naturalist Emil August Goeldi, to whom the Government of Pará payed tribute to in 1900, re-naming the Museum after him as the Museu Paraense Emílio Goeldi. Trail was the first foreign naturalist to produce an account of the early days of the Museum, having narrated in his diary:

" There are two curators & yet it is a miserable place, consisting of one room with a few upright cases along the walls. Two of the cases contain glass bottles chiefly filled with snakes & fish mixed together in dire confusion, & diversified with a few mammals here and there, & three human foetuses. Some of the reptiles & fish seem very interesting, but it is hardly possible to see what there is in the bottles. One tall glass jar is packed as full as it can hold with butterflies. There is no attempt at naming or classifying any part of the collections.

In the middle of the room are some flat cases containing Spirulae, Ammonites, limestone with nummulites, etc. The whole plainly having come from England or from N. America; but on being asked the localities from which the fossils had come the curators invariably replied the Tocantins, the Rio Branco or the Solimões. The recent shells were chiefly species of Bulimus. There are also a few insect cases containing beetles crowded together without the slightest care.

Along the top of the middle floor-case under glass were some birds fearfully & wonderfully stuffed, very ragged & in the most unnatural attitudes.

At one end of the room were some Indian curiosities, the most interesting being two sepulchral urns with the bones that were found in them. There were also the usual stock-articles of Indian manufacture; viz. hammocks, mandioca graters, etc. On the whole I came to the conclusion that the Museum is a miserable failure especially in a country so rich in natural curiosities. The specimens are few, in bad condition, & totally without arrangement, though there are tickets affixed to them which we were told refer to a catalogue which however was not forthcoming.

After spending about an hour in the Museum I walked off along a road in the suburbs for a little distance & found much more to interest me than I had done in the Museum" (Ms 851: 22).

During his stay in Amazonia, Trail had the intention of collecting botanical specimens to send to institutions in Britain (see Chapter 4), and also intended to put together a reference collection of Amazonian animals and plants for the Museum of the University of Aberdeen. To better accomplish his collecting commitments, he took with him some books on natural history and narratives of early voyages he thought would be useful. Bates' book was his main companion, and was used extensively as a reference work during all his voyage. Trail and the other members of the expedition had met Bates before leaving England, and Trail referred to this episode on his diary when narrating his encounter with a former Bates acquaintance at the Tapajós River:

... He [Sr. Antonio] told us that he knew an English Naturalist, -"Senhor Henriquez"- who lived sometime in Aveyros about 20 years ago and he was much interested to learn that we knew him, & had seen him shortly before leaving England (Ms 852: 27).

Trail and his companions left Belém for their journey up the Amazon River on board the S.S. *Belém*, the steamer in which they had been housed since their arrival. In spite of the Company's intention of having a boat permanently at the disposal of the members of the expedition, none was yet available at the time of their arrival. To overcome such a temporary drawback, they chose to embark on the *Belém*, a Company liner which sailed regularly between Belém and Manaus, with stops at a few villages between. This decision enabled them to sail directly to villages located on the banks of the Amazon River, which were used as temporary headquarters where the surroundings were explored on horseback or with rented boats.

The Captain of the S.S. *Belém* was the Brazilian Mr. Talisman de Vasconcellos, who coincidently had joined, as collector, the Agassiz's expedition to Amazonia in 1866 (Agassiz & Agassiz, 1975: 115). Along with Trail and his companions also sailed Mr. Pedro Vasconcelos, who joined the expedition as interpreter, and a Guyanian Indian named William, who had been for long serving the geologist C.B. Brown as his personal servant.

The Company had lands scattered throughout the Brazilian Amazon region, in a range which extended from the outskirts of the city of Belém to places as far westward as the Rio Javarí, at the border between Brazil and Peru (see Figure 1). The members of the expedition had precisely the assignment of locating, demarcating and surveying such vast territory, a task which demanded intense and continuous work.

The Lower Amazon

The village of Monte Alegre was chosen as the first outpost of the expedition in accordance with a suggestion of the Company's manager in Belém, Mr. Manoel Pimenta Bueno. Two years earlier, Bueno had been told by the Canadian geologist Charles Frederick Hartt (who explored the district of Monte Alegre in 1870 and 1871) that if coal was to be found in Amazonia, that would happen near Monte Alegre (Ms 851: 21). Bueno had also the information that the district in reference was the best for timber of the whole Amazon region. The village of Monte Alegre, situated in a brae at the mouth of the Rio Gurupatuba, was described by Trail as consisting of "a rather broken row of houses fronting the river ..." (Ms 851: 33).

The Company's agents at villages or cities where the expedition had scheduled stops, were instructed beforehand to provide the group with all the assistance needed. In this way, when the party reached Monte Alegre, the Company's agent there, Don Manoel, offered rooms in his own house to Trail and his associates, including the interpreter and Brown's servant. By coincidence, Don Manoel, a Spaniard from Gibraltar, had already had an early experience with foreign visitors, since he had put up for the night Mr. and Mrs. Agassiz during their trip up river (Agassiz and Agassiz, *ibid.*).

Trail's stay in Monte Alegre turned out for him an actual introduction to the natural history of the Amazon region. During nearly a month, he and the other members of the expedition, counting upon the assistence of a local guide, made short excursions to neighbouring areas, during which they visited farms already established and worked towards delimiting the Company's lands. The contacts Trail had with the locals meant for

him his first practical experience with the natural resources of the Amazon region. In his diary, Trail recalled an excursion to the Serra do Paraiso, in the Monte Alegre district, during which the guide showed him the useful species of plants along with their respective vernacular names:

> "...the guide showed me a tree of Pao d'arco (*Tecoma* sp.) the wood of which is used for making bows while the inner bark readily splits into thin papery layers when beaten and is used for cigarette covers. The wood of Murixi (*Byrsonima* sp.) a low campo tree with yellow flowers is used in chips to yield a reddish brown dye for clothes" (Ms 851: 42).

Trail used his spare time to botanize and collect zoological specimens in the neighbourhood of Monte Alegre, from where he recorded having caught several interesting species of insects and spiders, crabs, and small fish. The locals also used to give him specimens of fish, insects and of other zoological groups. Eventually, a small tip was given in payment for a novelty. A few days before the party left for another village, Trail had the opportunity of joining members of Don Manoel's family and slaves[2] on a night fishing trip to a mud bank at the Rio Gurupatuba. Despite the fact that Trail was unable to understand Portuguese at the time, he very much enjoyed the experience. The fish caught were described by Trail as belonging to the same species as those given him before by Don Manoel, which consisted mainly of "aruanas" (*Osteoglossum bicirrosun*), "acaris" (Loricariidae), "piranhas" (*Serrasalmus* spp.), "peixes-lança" (probably Gymnotiformes), and "curimatas" (Curimatidae).[3]

The Company's expectation in relation to the potentialities of the district of Monte Alegre, however, were frustrated. Coal was never found, and Trail's survey work in the

area did not confirm Pimenta Bueno's predictions regarding the production of timber in the region. In his report, Trail comments:

"After a preliminary survey around the district of Monte Alegre, I came to the conclusion that the trees of value as timber in this district around Monte Alegre are not numerous, ocurring only here & there in circumscribed areas & even where they do occur they are so scattered as to render it very doubtful whether they could be made use of profitably, as it would take much time and trouble to get together a shipload of any one kind & they are too heavy to float down river". (Ms 851: 71).

On the 14th November 1873, the expedition left Monte Alegre for Prainha, a village situated on the left bank of the lower Amazon and where the Company had lands to be demarcated. There they spent five weeks surveying its outskirts before moving further upriver. While in Prainha, they had the opportunity of meeting the Baron of Mauá, the former owner and the then current Chairman of the Board of the Amazon Steam Ship Company. The Baron, who was travelling with the Company's manager in Belém, Mr. Pimenta Bueno, favourably impressed Trail and his companions, specially because of his good manners and perfect command of the English language.

In December 1873, Trail, Brown, James Cunningham (a Jamaican who had replaced the former interpreter), William and two Portuguese servants left Prainha for Santarém, a city situated at the mouth of the Rio Tapajós. They found it much more developed than Prainha[4] and looking even better than Belém. Trail recorded in his diary:

" At about 8 p.m. we saw the lights of Santarem ahead and in about an hour we anchored off the town, quite a civilized place boasting street lamps...". " The houses here have a neater look about them that those in Pará, but are in noway remarkable. The whole town has a comparatively clean look & the streets are infinitely better & pleasanter to walk in than those in Pará...". (Ms 851: 111-112)

The city of Santarém, praised by its privileged location on the right bank of the mouth of the Rio Tapajós, was in full economic expansion at the time of Trail's visit. Several new business were being run by the local progressive society, including: wine and brick factories, limestone exploration, and plantations using modern machinery and implements. The foremost figure behind the process was the Baron of Santarém,[5] a successful local cattle rancher and businessman[6] who, at the time of Trail's visit, was promoting weekly meetings (called by him "debating club of gentleman") for discussing literature, science and other cultural subjects (Trail Ms 852: 22). To better develop his business, the Baron used to establish partnerships with foreigners settled in the area.[7]

On their arrival in Santarém, the members of the expedition found the local Company's agent ill, and were welcomed by an American, Dr. Stroop, who was temporarily in charge. They learned from him that about 8 to 10 miles south of Santarem there was a colony of 10 or 12 American families which, encouraged by the Brazilian Government, had migrated to the region in 1866 shortly after the U.S. civil war.[8] Along with the American immigrants, an English family group had also settled in the area. This latter group, which arrived in Santarem in 1871, consisted of the family of Henry Wickham, the man who later transfered the seeds of the rubber-tree to England (see Sub-chapter 4.3). In his diary, Trail recorded that the English family group was composed of three men and their wives: 2 Wickhams and a Mr. Pilditch, who was married to Miss Wickham. He also commented that the group had small plantations and rough houses, and had to do their own hard work because they could not find labourers. Trail commented gladly on his encounter with one of the families of the English group, who paid him and his companions a visit at their house in Santarém:

"One evening while we are all sitting in our shirt-sleeves Mr & Mrs Pilditch called on us ...It was a pleasant surprise to meet an English lady in Santarem. A day or two afterwards her brother Mr Henry Wickham called on us & had a long talk comparing experiences with Brown as he had gone up the Orinoco & down the Rio Negro & Santarem". (Ms 851: 114)

Trail never had the opportunity of paying back the visit to the British family, and only a plantation of one of the American settlers was later visited by him (see below).

The above mentioned effort of settling foreigners in Amazonia was not successful, just as an earlier initiative of the Navigation Company had failed in 1854 (see Note 2, in Sub-chapter 2.3). For the great majority of the Americans, the hope of enjoying a prosperous life in the Amazon valley never materialized due to the obstacles mentioned in Sub-chapter 2.3. After struggling some years in the region, they ended up by selling their business and returning to the U.S.[9] As for the British, it took them even less time to give up their hopes and return home. After some drawbacks (Dean, 1989: 38), and only three years after Trail had met them, they decided to leave the country. In the occasion, however, they took with them the *Hevea* seeds which later caused the well-known case of the breaking of the Brazilian rubber monopoly (see Sub-chapter 4.3).

Even though Trail had the help of locals to carry out his work, and was thus able to use his spare time to make natural history collections, his first months of collecting in Amazonia did not please him much. In his first letter to Dr (later Sir) Joseph Hooker, of the Royal Botanic Garden, in Kew, which was sent from Santarém on the 3rd January 1874, Trail expresses his discontentment by writing:

" Since my arrival in South America nothing of sufficient importance had ocurried in my experience to justify my troubling you with a letter, & my chief object in writing you at present is to say that before leaving Santarém, probably in about a fortnight from this time, I expect to send home a bundle of dried plants for the Kew Herbarium. I find that the way we have had to get through the work of surveying as yet has not been favourable to making a

large collection, so I have had to be content with three or four specimens of a plant & not unfrequently have had to pass by plants altogether from not having facilities for collectiong them at the moment... We have had to fix our headquarters in the small towns, working from them as centres in boats or on horseback...". (Appendix III letter nº 1).

After 33 days exploring the surroundings of Santarém, the party moved to Obidos. On their way, Trail lamented the change in the scenery, which shifted from the savanna, the sand banks and clear waters of the Rio Tapajós, to the not so interesting low swampy shores and muddy waters of the Amazon River. During the voyage, Trail also noticed cocoa plantations surrounding houses and sheds on the high grounds of the banks of the Amazon River, having stressed:

"The banks of the Amazon hereabout show numerous cocoa plantations around substancial houses, that would seem to indicate prosperity".[10] (Ms 852: 21)

After seven hours sailing, on 23th January 1874 they reached Obidos, a village situated on the left margin of the Amazon River. On board the approaching vessel, Trail admired the sight of Obidos from the distance, having noted the high mountain range of Serra da Escama to the east, and the narrowness of the Amazon River in front of the village.[11] He stayed for a month in Obidos and, as usual, spent most of his time exploring the surroundings and collecting specimens.

During his stay in the village of Obidos, Trail made acquaitance with Joao Barbosa Rodrigues, a Brazilian botanist who had been commissioned by the then Imperial Government of Brazil to collect botanical specimens in the Amazon region. Because Trail and the Brazilian botanist shared the same interest in the study of palms,

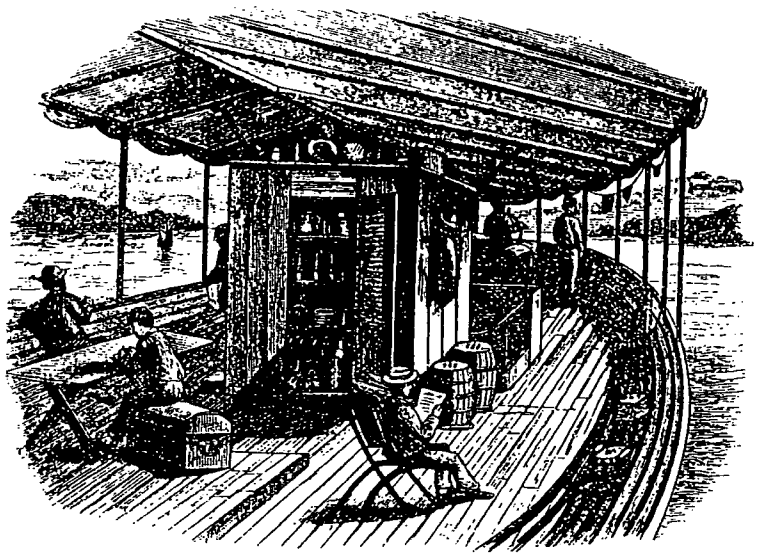
they met later on several occasions to collect jointly and exchange information on the various species which occur in the region (see Chapter 5).

Also in Obidos, Trail and his companions were introduced to a young Brazilian priest, Francisco Bernardino de Sousa, who had authored a book - *Lembranças e Curiosidades do Valle do Amazonas* - which contained a considerable amount of information on the Amazon region. This title, which had been published in 1873, was later much utilized by Trail and his colleagues on their work.[11]

Earlier, while still in Santarém, Trail had learned that a steamboat to be used exclusively by the members of the expedition was being towed from Belém to Obidos. This meant that their travelling difficulties could be finally coming to an end. When Trail met the steamboat on her arrival in Obidos, however, he felt extremely disappointed by what he saw. His frustration was recorded in his diary:

> "a mere boat with a sheet iron roof, but no attempt at a cabin and extremely little stowage room".(Ms 852: 01)

In spite of Trail's disappointment with the modest size of the steamer, the other members of the expediton did not share his view and felt actually relieved by finally having their own means of transportation (Brown & Lidstone, 1878:222). The boat, named *Beija-flor* (humming-bird) (Plate III), had a crew of six: a captain, an engineer, a fireman, two sailors and a boy. This meant that the boat's crew, plus the members of the expedition (including the interpreter and Brown's personal servant), were to spend the



DECK OF 'BEIJA FLOR.'

Plate III

The boat *Beija-flor* (humming-bird), used for the exploration of the tributaries of the lower Amazon and the Rio Negro. From a drawing by W. Lidstone, *in* Brown and Lidstone (1878).

next five months crowded together on board the *Beija-flor* for their voyage along the lower Amazon and its tributaries.

Since the boat had no cabin, Trail and his companions were forced to sleep on the deck, on hammocks which were hung there for this purpose. Surprisingly, however, they shortly got used to such exotic practice, having felt much less discomfort than thought at first.

The first river explored at this phase of the work was the Trombetas, one of the most important tributaries of the left bank of the Amazon, and which was distinguished by the abundance of "castanha-do-Pará" (*Bertholethia excelsa*) on its banks. Although the Company's lands on the Trombetas had been already chosen, delimited and surveyed by the Company's engineers[13] (Ms. 852: 151), Trail and his colleagues spent 21 days exploring this river. For this leg, they had on board two extra companions: the Brazilian botanist Barbosa Rodrigues and his personal servant (see Chapter 5).

The stops along the river banks were made either for getting wood for the steamer, or for carrying out their survey work. Further stops were made only at sites considered as scientifically relevant. The strategy followed was to select the stops on their way up river, and land on them on their way down. This method, by the way, was later followed in all the rivers explored.

During the stops, the party had the opportunity of observing the great quantity of nuts which had been collected for sale. They also met two runaway slaves with a boat loaded with Brazil nuts to be commercialized. Their house, to which they were invited to, was described by Trail as of "consisting only of poles supporting a palm leaf roof, and just below the roof a stage & above this the hung hammocks".[14] (Ms. 852:10).

On his return to Obidos, Trail started to prepare the botanical and zoological specimens collected during his trip up the Trombetas which were to be sent to England. The rest of the time was spent writing letters, both home and to the Royal Botanic Gardens at Kew.

Only two days after having landed in Obidos, they returned to Santarém and initiated a second trip up the Rio Tapajós (during their first trip to that river, made a month earlier, they only reached the nearby village of Alter do Chão). Besides earlier visits as those by Bates and other foreign naturalists, the Tapajós had also been also geologically and geographically surveyed by the Americam geologist C. F. Hartt three years before Trail's arrival. As leader of the Morgan expedition'[15] Hartt studied the archaeological sites of the local table lands, the limestone sites, and the fossils found along the river banks (Hartt, 1870; 1871; 1874a, b).

This leg of the journey up the Tapajós took Trail and his companions as far as the first rapids called "Maranhãozinho". While sailing along the Tapajós, Trail had the opportunity to follow Bates' footsteps closely. In a place called Itapuama, for instance, Trail found the same plantation of the fish poison "timbó" (*Paulinia pinnata*) which had been mentioned by Bates in his book (1969: 252).[16] In a similar fashion, at Santa Cruz, he had the opportunity of seeing the same "campo", or savanna, described by Bates:

> "As Bates mentioned a campo near the village we got our conductor to take us to it, and passing through some 200 yards breadth of forest we arrived at open country with numerous scattered clumps of trees & bushes... Our guide told us the campo extends far...". (Ms 852: 43).

The village of Aveiros, situated on the right bank of the Tapajós and where Bates had been in 1852, was reported by Trail as exhibiting the same appearence as Bates had recorded in his book, having thus not prospered at all in 22 years. When inquiring a certain Mr. Antonio, a former local Bates acquaintance, on the causes of the neglected look of the village, Trail was informed that nearly the whole population of Aveiros was involved with rubber collecting, staying out in the forest for most of the time. The Brazilian blamed the unattended houses for the decayed look of the village. Along Trail's visit to other Amazon tributaries on the lower Amazon, the same situation was ocurring in the villages.

Further upriver, at a place called Matatebem [sic], they met one of the Americans of the American colony of Santarém who had plantations of rice and sugar cane in the area. Trail admired the thriving plantations of the American, and noted that he had several Indian women working for him. When inquired about the Indian labourers, the American informed that the "Mundurucus indians, from above the rapids of the Tapajós, can be procured here as labourers in any numbers, for $400 (four hundred Réis) a day and their food".[17] It should be emphasized that the use of currency to pay for Indian labour was an extremely unusual practice both in the lower and upper Amazon at the time. A Brazilian explorer, Antônio Tocantins, who reached the headwaters of the Rio Tapajós in 1875, reported that the Mundurucús Indians were being explored as slaves by the rubber merchants, a situation that aggravated further as the rubber business expanded. The condition observed by Trail, therefore, was an atypical one.

Trail recorded in his diary many other thriving plantations on the banks of the Tapajós River, and became well impressed with a farm owned by a Portuguese family,

which had been established in the area for more than 30 years cultivating mainly coffee and cocoa. Trail noted that this particular farm used implements such as carts and wheelbarrows, which were rarely seen by him being utilized in other parts of the Amazon region at the time. He also noted that this farm used free hands as labourers.

By the time Trail was traveling in Amazonia, the commerce of rubber was in full expansion in the region. This accounts for his observation that most of the local population, the Indians included, was involved with either rubber collecting, or its commercialization. Trail also noted that nearly every single rubber tree growing on the banks of the local rivers had already been tapped.

Trail needed to collect seeds of the rubber tree (*Hevea*) to send to England (see Chapter 4), and tried to obtain some seeds at the Tapajós, as at the time of his entrance in the river, the marginal forest was flooded and the water level was still rising. However, he was not successful, and was also told at the time, by a native, that the proper time to collect seeds at the Tapajós was the month of July. Coincidently, this same epoch was later suggested to him as the appropriate time at the Rio Madeira. Both pieces of information, however, turned out afterwards to be innacurate, since the species of *Hevea* drop their seeds during the wet season, when the forest is flooded. According to Goulding (1980: 13), the waters of the Madeira and Tapajós rivers rise for about six months, beginning in September or early October and reaching their maximum level in March or April, the exact time that Trail was surveying the river banks. From then on, the water level starts to fall. In this way, in July, the waters of both rivers are almost reaching their minimun level, which is precisely the least favourable time to collect rubber seeds.

After 10 days sailing along the Tapajós, the expedition returned to Obidos, where they had left behind some of their belongings. After two days at this village, they sailed again to other points of the lower Amazon to carry on with their work. The Juruti and the Jamunda were the next rivers investigated, and a month after leaving Obidos they arrived at Serpa, where they demarcated more lands for the Company. From this latter village, Trail wrote to Dr. Joseph Hooker, Director of the Botanic Gardens, at Kew, to inform that he was sending the plants collected during his journeys with the steamboat *Beija-Flor*. He also added that, even having now a much better infrastructure, conditions were still not ideal since the boat was small and had limited storage room. Due to the lack of space, therefore, a selection of what should be collected had to be made, and he had chosen to prioritize palms and other plants considered by him as more interesting (see Appendix n0. III, Letter 3).

Before the expedition reached Manaus and entered the Rio Negro, Trail and his companions explored the rivers Maués, Abacaxis and Madeira for surveying the Company's lands located in that region. This leg of the journey lasted for 2½ months, during which Trail took the opportunity to augment his botanical and zoological collections, having concentrated mainly on palms and insects, particularly butterflies.

It should be mentioned that, when surveying the above rivers, Trail noted that the villages along the river looked as abandoned and decayed as the ones he had seen at the Rio Tapajós. Whenever he asked about the causes for such neglect, the same answers were invariably given: the rubber collectors were to blame for the dilapidated look of the houses, since they regularly left them uncared for.

When sailing the Madeira, Trail noted that, although the local soil was relatively fertile, few cultivated areas could be seen along the river banks. This was probably due to the fact that rubber trees were found in great abundance along the Madeira, which dissuaded other activities besides rubber collecting. In fact, the richness of the *Hevea* grounds of the Madeira were such that they even encouraged collectors from other areas, such as those from the Rio Maués, to travel to the area in search of rubber.

Trail's zoological and botanical observations on the tributaries of the lower Amazon River are rather superficial, since were made from the boat or during short stops to take wood for fuel or survey the Company's lands. During the stops, Trail never ventured for more than a mile and a half into the forest, and always searched for a path which could lead him to sites where interesting botanical and zoological material could be found. He was also engaged in verifying with the locals the production of vegetables of the areas visited.

Even though Trail spent a rather short time collecting during the stops, he was still able to note the great variety of plant species thriving along the river banks. Along the Trombetas, besides the huge Brazil nut tree (*Bertholletia excelsa*), he also observed, among others, the "muiratinga" (*Olmediophaena maxima*), the "piquia" (*Caryocar brasiliensis*), the conspicuos palms "assaí" (*Euterpe oleracea*), "inaja" (*Maximiliana regia*) and "jauarí" (*Astrocaryum jauari*) and also mixed with the foliage "masses of flowers red yellow, pink and white like convolvulus, large potato flowers and foxgloves (Bignoniaceae, Gesneraceae)". He noted also that the average height of the trees was 30 to 60 feet in total, the "taxi" (*Triplaris surinamensis*) being amongst the highest.

At the Tapajós, appart from the magnificent "sumaúma" tree (*Ceiba pentandra*), the "munguba" (Pseudobo*mbax munguba*), the "itaúba" (*Mezilaurus itauba*), the "piquia", the Brazilian nut-trees, and the abundant "jauarí" and *Lepidocaryum* palms he also observed the impressive water lily (*Victoria amazonica*) in its natural habitat. Along the Jamunda, besides some large trees such as "abiurana" (*Micropholis* sp.), "carapanaúba" (*Aspidoesperma excelsum*), and "jutaí" (*Hymenaea courbaril*); the palm trees "inaja", "tucuma" (*Astrocaryum vulgare*) and "bacaba" (*Oenocarpus disticus*) were the most distinct. The pink blossoms of the "tauarí" trees (*Couratari tenuicarpa*), observed at the Rio Maués, also called also his attention. Yet, the "pau-mulato" tree (*Calycophyllum spruceanum*), observed at the Rio Madeira, was the species which deserved from him the most enthusiastic description. On his diary he registred:

"The forests along the Madeira are much adorned by the profusion of a singularly handsome tree - the Pao mulato, remarkable alike in its habit of growth, its beautifully fresh foliage & its outer bark which peels off & leaves a smooth polished umber-brown surface". (Ms 852: 138).

Besides the widespread "pau-mulato" and "seringa" (*Hevea brasiliensis*) trees, and the "urucuri" (*Attalea excelsa*) and "bacaba" (*Oenocarpus* sp.) palms, Trail noted that other Rio Madeira species were similar to those found along the Amazon River. Of the widespread species, he observed willows (*Salix* sp.), the "embaúba" (*Cecropia* sp.), "aripari" and cassia (*Cassia* sp.) trees, the "jauarí" and "attalea" palms, the bamboos (*Guadua* spp.), ingas (*Inga* spp.), cipós of all sorts, solanums (Solanaceae), as well as species of Marantaceae and Convolvulaceae.

In regard to the animals observed at the lower Amazon, Trail mentioned the very frequent alligators (*Caiman* spp.), the turtle *Podocnemis expansa*, the dolphin "tucuxi" *Sotalia fluviatilis*, peccaries (*Tayassu* spp.), and primates such as the "howling" (*Alouatta* spp.) and "spider" monkeys (*Ateles* spp.).

The birds were met with frequently, and he recorded, among others, various parrots and Parakeets (Psittacidae), the blue and yellow macaw (*Ara* sp.), toucans (Ramphastidae), herons (Ardeidae), and the "cigana" (*Opisthocomus hoazin*). A few bones and stuffed specimens of Amazonian birds and mammals were taken, and together with the fishes collected, were deposited at the Aberdeen Museum (see Chapter 4).

Trail did not collect ethnographical material. The Indians he encountered during this part of the voyage were already semi-civilized, and the few contacts made were invariably to buy wood for fuel or fowls. The Mundurucús were seen in great numbers along the Rio Tapajós and Maués, while the tribes Muras and Araras were met with along the Madeira. Trail learned that other tribes also inhabited the region, but was not able to contact them. Among such groups were the Ariquena, on the Trombetas, and the Parentintins, Caripúnas, Canga-pirangas and Urupé-manacas, on the Madeira. From the latter, Trail learned that they were a peaceful tribe, and were already being hired with success to tap rubber (Ms 852: 164).

Manaus and the Rio Negro

Having finished their work at the Madeira, on the 7th June 1874 the expedition members landed in Manaus, a city located at the mouth of the Rio Negro. This stop was very much appreciated by Trail, who commented in his diary:

" The town is built on 3 small hills separated by igarapés spanned by good wooden bridges... the principal street, Rua Brazileira ... is a fine broad street with good shops... Many of the houses would do no discredit to any country... On the whole Manaus looks neater & cleaner than Pará". (Ms 852: 181)

After spending 8 days in Manaus, the party began their journey up the Rio Negro (where the Company had 3 areas in the region to be chosen) having reached as far upriver as Santa Isabel. This small village, situated on the north bank of the upper Negro, had been abandoned for some time due to the unhealthiness of its surroundings. When visiting the place in 1851, Richard Spruce had already noted that Santa Isabel was a deserted village. In a letter to Mr. John Smith, of the Royal Botanic Gardens at Kew (Spruce, 1908: 268), Spruce commented that the Rio Negro should actually be called "dead river", in view of the scarcity of inhabitants found along its banks.[18] Trail had the same impression, having remarked in his diary:

"The banks seem very thinly inhabited, so much so that we have seen only 3 or 4 houses today besides Conceiçao..." [a small settlement with only five houses] (Ms 852: 188).

Trail also detected whole families in the Rio Negro area in a grave state of illness, having been requested at times to examine and medicate the sick. In his diary, he reported:

" The padre [vicar] at once asked me to go & see some sick people so I went off, & saw a man who had a severe attack of intermittent fever, & a girl in a very low & weak state with continued fever." (Ms 852: 201).

In fact it was not only in the Negro that he had been requested as a doctor. During all his voyage up the Amazon it had occurred frequently, mainly in the upper Amazon and tributaries. When back in Aberdeen in 1875, Trail gave a talk on the common diseases occurred in the Amazon region at the Aberdeen Medical Association and concluded that in a whole, the Amazon region was not so unhealthy as thought in the beginning if the necessary care for a healthy life was taken.[19]

After the expedition had sailed past the mouth of the Branco River, a local pilot, well acquainted with the area, was hired to take the boat upriver to the falls beyond Santa Isabel. By coincidence, this same man - Mr. Manoel -, had worked for both Wallace and Spruce as a collector. When they left the pilot back at his home village, Manoel took the opportunity to send, through Trail, a note answering a letter he had received from Wallace some 18 years earlier![20]

For Trail, the journey up the Rio Negro represented a unique opportunity to enrich his collection of palms, if possible with species not seen earlier by both Wallace or Spruce. In fact, his expectations were surpassed, since palms were abundant on the banks of the Negro and were gathered in good numbers. The material obtained included

several prized species collected on the banks of the Rio Padauiri, a tributary of the Negro. On a letter sent to Kew when back in Manaus, Trail reveals his contentment with the palm collection made on the Rio Negro, by commenting:

> "...I have added a good many ... palms on my collection on both the Rio Negro and Rio Padauiri, some of them described by Spruce & therefore in Kew Herbarium, but a good many of them not mentioned by him. On the Padauiri river especially I found several species undescribed by him especially an *Attalea* which bothers me a good deal..." (Appendix .III, letter nº 5).

Trail found the banks of Rio Negro flooded and noticed that the trees seldom reached 18 inches in diameter, the best observed being the "itaúba", "carapanaúba", "guajara" (*Chrysophyllum excelsum*). During this journey, Trail also collected some remarkable animals for the Natural History Museum of the University of Aberdeen, such as the peculiar Amazonian turtle known locally as "matamata" (*Chelys fimbriata*).

The trip up the Negro lasted 23 days, and on her arrival back in Manaus on the 7th of July 1874, the steamboat *Beija-Flor* presented some structural damage and had to be sent to Belém for repair. The expedition party had thus to be transfered to another steamboat, and boarded a line vessel which regularly sailed the upper Amazon. While waiting the arrival of their new transportation, the geologist Brown made a quick trip to Belém for settling the final arrangements for the final leg of the expedition. On the meantime, Trail and his other colleagues remained in Manaus for surveying the Company's lands in the area, that included an early colony founded by the Baron of Mauá nearly 20 years ago (See Sub-chapter 2.3).

During the nearly two months that Trail stayed in Manaus, he took the opportunity to augment his zoological and botanical collections, and to send to Kew Gardens and the University of Aberdeen all the material collected during his previous journey (see Sub-chapter below).

Some of Trail's excursions on the vicinities of Manaus were extremely fruitful. A site specially productive was a spot close to the falls of the Rio Taruma, which was recorded by Trail as one of the most beautiful of the whole Amazon region. This site, famous by its beauty, was then a place which called the attention of other naturalists visiting the region, Spruce for instance. Trail described in his diary:

" ...The scene is one of the most striking that I have seen in Amazonia and well deserves a visit for its beauty. Even in full daylight the fall & its surroundings are almost in twilight owing to the surrounding forest. Behind the fall the rock is hollowed out ... and from the sides of the ledge hang columnous masses of creepers covered with epiphytes & Parasites. The moist rocks are covered with a wonderful profusion of ferns (chiefly *Trichomanes*), Selaginelae, and other Cryptogams, and I collected largely among them....Well loaded I returned to the top of the fall & stowed away the plants in a portfolio of paper that I had brought, & then botanized along the banks of the stream... I had to make 3 journeys with specimens to the canoe which was well filled." (Ms 852: 243-5)

On 14th July, while still in Manaus, Trail had the opportunity of witnessing the arrival of the S.S. *Lilian*, which was the second ship to sail direct from Liverpool to the heart of the Amazon region (the first one had arrived in Manaus at 30th April).[21] On the occasion, the steamship was saluted by flags and guns, and rockets were fired off. For the locals, the event meant the consolidation of a direct and permanent link with the outside developed world. This much praised venture was due to the initiative of a

Portuguese businessman, who associated with British entrepeneurs for the enterprise (See Sub-chapter 2.2.).

The foreigners who arrived with the *Lilian* had the ambition of building fortunes by exploring the region's natural resources. A sceptical Trail commented on the naive enthusiasm of a newly arrived countryman, whose project for making easy money was based on the exportation of vanilla to the London market, and the establishment of a partnership with the locals for building a brick factory, for which he intended to import British workers. In his diary, Trail reported:

> "Even yet Thicke is under the idea that he can make a fortune by collecting Vanilla which sells at £1 per 1lb in London. During the time I have spent in Brazil I have seen hardly a score of plants, & of them not one has been in fruit. It shows how easily people may be deceived". (Ms 852: 231).

The replacing steamboat, the S.S. *Guajara* (Plate IV) arrived in Manaus on 3rd August 1874. Trail and his comrades, however, only resumed their trip to the upper Amazon on 31th August 1874.

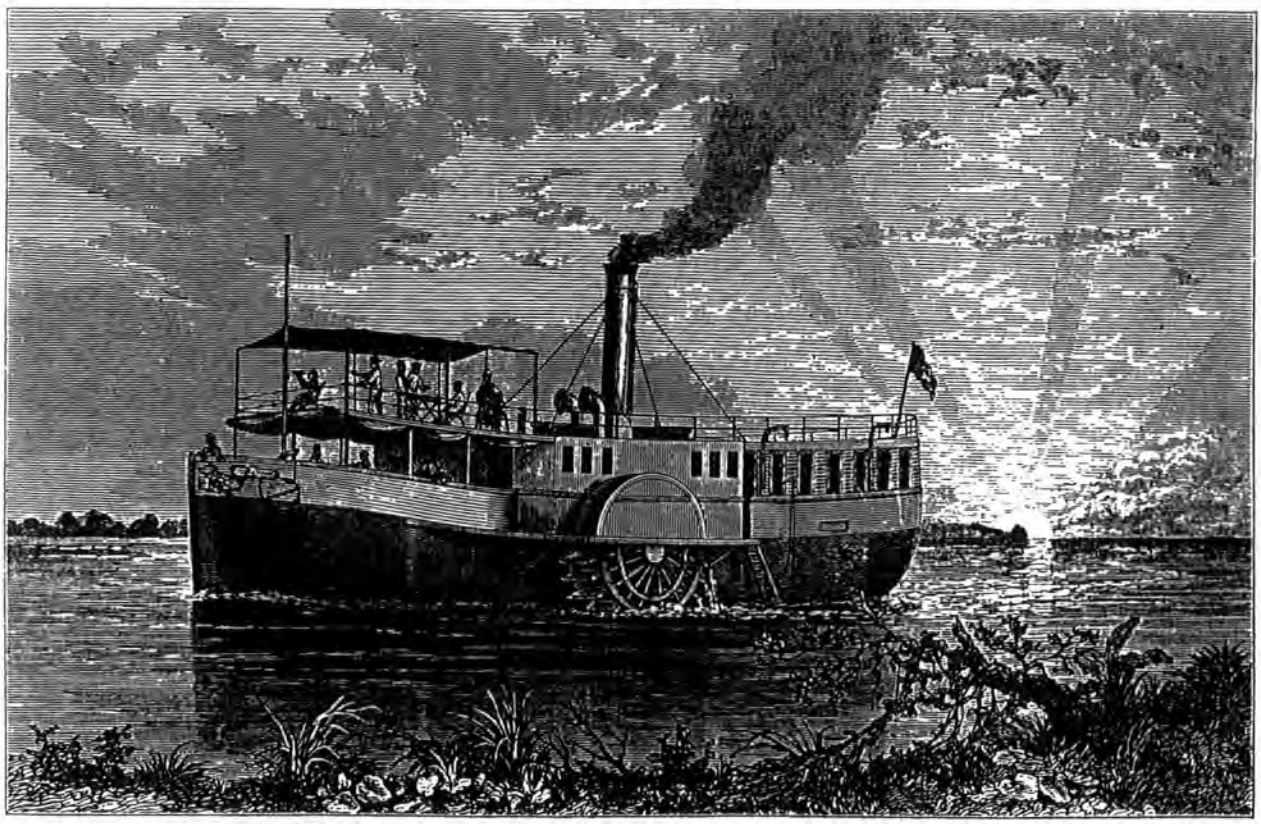


Plate IV

The steamboat *Guajara*, used during the final leg of the expedition (i.e. the exploration of the tributaries of the upper Amazon. From a drawing by W. Lidstone, *in* Brown and Lidstone (1878).

The Upper Amazon, or Solimões

The voyage up the upper Amazon River to Tabatinga, at the border between Brazil and Peru, was considered by Trail as the most promising of the whole campaign due to the prospect of exploring the most important tributaries of the right margin of the Amazon - the Purús, Juruá and Javarí. The scientific collections which were to be made by Trail in the region had a most significant aspect: he was the first scientist to enter the Juruá, Javarí and Jutaí rivers with the aim of collecting botanical and zoological material. He was also to be the second naturalist to make a scientific collection of plants in the Purús River following the German botanist Gustav Wallis in 1862. [22]

The new double-decked steamboat *Guajara* was considerably larger and more comfortable than the earlier *Beija-Flor*. Her commander was a German Captain named Hoefner, who was able to speak Portuguese and English besides his native language. The crew, including the scientists and the interpreter, amounted to 18 persons, a total which would not overcrowd her. An additional stimulus for Trail was that fact that he was given the purser's cabin for exclusive use, a compartment in which he would find adequate space for stocking up his collections.

The Rio Purús was the first tributary of the upper Amazon to be surveyed, and Trail and his associates sailed along it from the 7th September to 13th October 1874. The Purús was of great interest to the Brazilian Government because of its natural resources and, most of all, its extended navigable course. At the time the Government was seeking for a direct comunication with Bolivia, which it though possible through the tributaries of the right margin of the Purús. A decade earlier, due to its strategic

importance for navigation, the Purús had been geographically surveyed by two Brazilian expeditions.[23] In addition, it had also been surveyed by the British geographer William Chandless in 1864-1865 (Chandless, 1866).

The expedition entered the Rio Purús in September, the month during which its water level is reduced to its minimun. Trail found the river very winding and the water clear, and noted its high banks, which in places were 30 to 40 feet high. He described the forest along the banks of the Rio Purús as:

> "much like those of the Solimões, but palms are far fewer though of the same species, & monguba trees, at present just bursting into leaf, are far more numerous ... Imbaubas (*Cecropia* sp.) are fewer ... The undergrowth of the forest seems to consist largely of bamboos, not much of Musaceae, The most noticeable flowering tree is the yellow-flowered leguminous tree found by me at Manacapuru". (Ms 852: 263)

Trail also observed that willows (*Salix* sp.) constantly formed a fringe in the water along the edge of the shores. On his first day upriver, close to the river mouth, he observed "numbers of large flesh-coloured dolphins [*Inia geoffrensis*] ... visible but none of the black species [*Sotalia fluviatilis*] common in the Amazon." (Ms 852: 263).

The time the expedition was heading upriver coincided with the period that the "Amazon turtle" (*Podocnemis expansa*) was laying eggs on the sandbanks of the river. The nests abounded along the shores, and at every stop the crew of the *Guajara* took the opportunity for seeking turtle eggs, a delicacy much appreciated locally. At times, they also found turtles laying on the beaches in great numbers, a chance they took advantage of for capturing several adult specimens.

Also commonly found on the sand beaches were eggs and young of birds such as gulls (*Sterna superciliaris*), reported by Trail as "common along the river"; lapwings (*Hoploxypterus* sp.), and nightjars (*Chordeiles rupestris*), the latter also observed in great numbers. Lizard eggs, such as those from the *Iguana* sp., were also found on the sandbanks.

It is known that, during the low water periods, the shallows of the Purús attract great numbers of fishes in their search for food (Goulding, 1989). Trail witnessed this phenomenon, and took the opportunity to put together the richest fish collection he obtained in the Amazon region. In his diary, he recorded the nights spent fishing on the sand beaches of the Purús, later commenting in a paper read in Aberdeen:

> "I had purchased a casting net in Manaos & I allcwed our men the use of it to catch fresh fish for themselves & for us, taking as my own share specimens of all the species caught for a scientific collection since deposited in the Museum of Aberdeen University. In this way I obtained over 50 spp. from the Purús River, several of them, as far as I can ascertain, new to science..." (Ms 2988/1/2)

The low water period was the proper time for rubber collecting, and Trail took the opportunity to contact some of the collectors working along the Purús. By doing so, he was able to watch the preparation of the rubber, which was coagulated with the smoke of the burned "stones" (i.e. seeds) of the urucuri palm (*Attalea excelsa*), which is extremely common in the region. This process was used in the whole Amazon region, and Trail had already collected the urucuri and been already been told about the process when in the lower Amazon. At the occasion, Trail was told by a "seringueiro" (rubber-gatherer) that, when the forest is flooded, the rubber trees become covered by 3 - 4 feet of water and they go instead in search of the copaíba (*Copaifera langsdorffii*) at

higher grounds. Indeed, Trail noted marks of the flooding high up the trunks of the forest trees. In his diary, he registered:

" We soon entered open forest in which the flood mark was visible on the tree trunks about 20 feet up & the trunks & young shrubs bore quantities of hard freshwater sponges". (Ms 852: 302).

Trail also noted that the only settlements found along the Purús River were the shacks of the rubber-gatherers, the great majority of which were left abandoned during the wet season.

The open forest of the Purús River was a perfect ground for Trail to enlarge his botanical collections. Not surprisingly, his beloved palms were the focus of his attention, and many different species were added to his collection. At "Barreiras de Maniúva" he described how: "The undergrowth abounded in palms, *Iriartea setigera* (here rather small, *Geonoma* with simple spadice & leaves like *G. aspidiifolia* ... *Bactris*, *Bactris elegans* (sp.n.?), & a palm belonging to a genus I have not seen before...". (Ms 852: 298),

The Paumaris indians, a common tribe which inhabited the banks of the Purús and bore a peculiar skin disease,[24] were met with on several occasions along the river. During the dry season, the Paumaris occupied the sand beachs of the Purús to fish and search for turtle eggs. On his diary, Trail recorded having passed by many huts of these indians along the beaches, which he noted were built of palm leaves laid over hops stuck into the sand. The Paumaris were known by their peculiar and rare habit of not using hammocks. Curiously, however, Trail reported having seen, close to a hut and stuck into the sand, "some short poles supporting very small hammocks, possibly for

children's use" (Ms 852: 282). Such observations may well be regarded as a testimony of the inevitable changes in customs already in course for the Purupurus' Indians.

After the expedition reached a place in the upper Purús called Huitanaã, it started its journey back, re-entering the Amazon on the 13th October 1874. From the mouth of the Purús, they resumed their journey along the upper Amazon (or Solimões).

Before the expedition reached the Juruá River, the *Guajara* made stops at Coari and Tefé, the latter of which being the village where Bates had established his headquarters during his stay in the upper Amazon. Regarding Tefé, Trail noted in his diary:

> "Bates' description of the city & its surroundings is still very applicable, as there appears to be hardly any change since he left, or even since he first saw it..." (Ms. 853: 7)

Trail very much appreciated the whereabouts of Tefé, where he obtained very good collections of insects and plants.

Leaving Tefé and sailing further up the Amazon, Trail and his companions visited a farm at a place called Paráuari, some 20 miles from Tefé. Their goal was to obtain wood from a former Bates' acquaintance, a certain Mr. João da Cunha Correa. Trail seems to have become much impressed by the thriving plantations (mainly tobacco) and the overall organization of the place, having stressed in his diary:

> "This settlement is the nearest approach that one have seen to a realisation of Wallace's ideal of what might be made of the Amazon valley". (Ms. 853: 14).

When on Mr. Cunha's farm, Trail heard from him about the barbarisms practiced in the region to capture Indians for labour, especially the Miranhas of the Japura river. Curiously, however, Trail observed that Mr. Cunha himself was using many Miranhas Indians as labourers on his plantation. In fact, the Indians even helped to load the wood on board the Company's steamer. Trail learned later that, in the upper Amazon, the landowners and modest businessmen still utilized the banned system of semi-slavery. Bates (1975: 256) had already mentioned the practice of subduing Indians in the upper Amazon, commenting that it was the only possible way to obtain labourers in the region. As observed by Trail, nearly 20 years afterwards the situation still remained the same.

The Juruá River was reached on the 24th October 1874. Due to its great similarity with the Purús, only the more distinctive aspects and relevant facts are considered below. In comparing both rivers, Trail noted that the Juruá "seems to be much like the Rio Purús, but is not above half as large, & has lower banks which are more grassy, & want the very regular fringe of willows" (Ms. 853: 19).

Along the sandbanks of the Juruá, Trail observed several huts of fishermen and collectors of turtle eggs, types which he had not seen before at the Purús. In the largest of the camps, which was formed by 10 or 12 huts, he observed large pieces of pirarucú meat (the fish *Arapaima gigas*) spread out to dry. Trail also noted that alligators were seen in the Juruá in far greater numbers than they were at the Purús. Equally abundant were the newly hatched turtles.

The forest abounded with "seringa" trees (*Hevea* spp.), also being common the "sumaúma" (*Ceiba pentandra*), which Trail described there, as being the finest ever in his whole voyage in the Amazon region, the "pau-mulato" (*Calycophyllum spruceanum*),

and "miratinga" [or muiratinga], all frequently seen from the boat. Palms and ferns were also numerous.

At the time they entered the Rio Juruá, the waters were starting to rise and Trail lamented the fact that the beaches presented no pools for the collecting of algae, a practice followed before at the Purús. The night fishing activities by Trail and the boat crew, however, were as successful as had been at the Purús.

During the mid 1860's, the Purús and Juruá rivers had been invaded by rubber-collectors, who occupied their banks seasonally during the collecting periods. In spite of this influx of people, not a single village had yet been formed at the time of Trail's visit. Comparing the process of occupation of the two rivers by the rubber-gatherers, a much smaller number of huts was seen at the Juruá than at the Purús. Regarding the local Indian population, not a single individual was met with during their journey up the Juruá.

The rapids of "Urubu Cachoeira", near Marari, was the farthermost point reached by the expedition on the Juruá. On her way downriver, the *Guajara* only called at the wood stations, places where Trail invariably landed for improving his collections. On the 15th November, the expedition again reached the upper Amazon (Solimões) and, sailing upriver, headed for the Javarí, the tributary which marks the border between Brazil and Peru.

It is worth noting that the inhabitants of the river banks observed by Trail in the upper Amazon were mostly involved with fishing or turtle hunting and egg collecting. The occupation of rubber-gathering, a commonly observed activity at the lower Amazon, was just starting at this part of the region at the time.[25]

During the few stops made by the *Guajara* on her way up the upper Amazon, Trail, as has been already referred to above, was frequently requested to function as a medical doctor. When in Barreiras das Araras, a settlement on the south bank of the upper Amazon River, one particular case very much disturbed him. In a house he entered to see the ill, he found, besides two sick men, not less than four children of the Miranhas Indian group, all in need of medical assistance. Among the Indian children, one of them was in so grave a state that Trail saw it as a "mere skeleton". On that occasion, he was told by the owner of the Indians that nearly all of the Miranhas brought from the Japura River died very soon after their arrival. Trail was also asked by the man - a trader who explored a commercial establishment locally - if he could provide medicine to recover the sick Indians.

By witnessing such tragic aspect of Indian slavery, Trail fully confirmed the information passed to him earlier at Parauari by Mr. Correa: "traders go up it [the Rio Japura], & despite the laws continue to buy indians there, chiefly Miranhas. A boy or a girl can be bought for ... 4 jaguar's teeth, the currency on the Japura" (Ms 853: 11). Shocked, Trail commented in his diary:

> "This traffic in indians is simply slow murder". (Ms 853: 39).

In his travel book, Bates (1975: 259) reported a similar case, since he took care himself of two Indian children who had been just taken from their tribe and arrived to his place, at the village of Ega, in a very poor state.

After stops at Fonte Boa (at the mouth of the Rio Sapó), Tonantins, São Paulo, and Tabatinga, the expedition finally reached the Rio Javarí on the 1st December 1874. The party spent nine days exploring this river, an area where the farthermost lands of the Amazon Steam Navigation Company were located.

Trail found that the Javarí resembled the Solimões in water type and marginal vegetation, having observed on its banks mainly the trees "pau-mulato", "embaúba" (*Cecropia* sp.), "envira" (*Pseudoxandra* sp.), "sumaúma", "munguba", and sparse rubber trees.

On his way down the Javarí, Trail noted many good houses along both banks of the river, i.e. in the Brazilian and Peruvian margins. The expedition made stops indistinctly on both banks, either to obtain wood or explore the sites.

During an excursion to the forest of the Rio Javarí, Trail observed that nearly all the rubber trees had already been tapped. He also noted that they were much less numerous there than at the Juruá and the Purús. When mentioning the fact to a native, however, he was told that rubber trees were as numerous at the Javarí as they were at the Juruá. Those from the Javarí, however, were more watery and hence less valuable.

As for his collecting activities, he was pleased by the quantity and variety of palms obtained, a group locally abundant. Recorded from the forest were the trees "apiu" [sic], "taquari" (*Mabea angustifolia*), "itaúba", carapanaúba, and *Lecythis* spp. Trail was informed by a local that the best timber of the Javarí was the "itaúba". He was also told that the Brazilian nut tree did not occur in the area.

Insects (mainly Hemiptera) and other invertebrates were also caught in good numbers. Fossils were also collected.

When sailing down the Javarí, the expedition members encountered some Tucuna Indians on the Brazilian margin of the river. They were all semi-civilized but could not speak Portuguese. In one of the house visited, described by Trail as well built and with " an excellent roof of "ubim" leaves [*Geonoma* sp.], projecting beyond the walls, & supported on posts so as to form a narrow verandah all round the house" (Ms.853: 62), he bought from them some typical artefacts to take home as souvenirs as himself stressed, and his fellow bought a live marmoset monkey [Callitrichidae] which he had to leave behind when they arrived in Belém.

The last locality visited by the expedition in the Javarí was a place at the Peruvian margin called Camana. From that point on up river they were told that only one house existed at about 1½ day by canoe. After spending two days at the site collecting and carrying on their survey work, Trail and his associates started their journey back downriver, having re-entered the Amazon (Solimões) on the 9th December 1874.

During the return journey to Belém, sailing near Tefé, the expedition members received orders from the Company to survey the Rio Jutaí, a large tributary of the Amazon which had been neglected because the Company had no lands on its banks.

At first, the unexpected news did not please Trail and his mates, since they had already passed the mouth of the Jutaí and were on their way to Manaus. Later, however, Trail praised the unanticipated journey, especially because of the significant new material [mainly the new palms and varieties] he would be able to collect in the area.

Due to *Guajara*'s proximity to Manaus, the expedition members decided to land there first in order to refit the boat for the new journey. After spending 17 days in the city, the *Guajara* finally left Manaus for the Jutaí, and entered it on the 19th January 1875.

It is important to stress that the scientific commission which Trail took part in, was the first to survey the Rio Jutaí. In his diary, Trail gives a detailed account of the natural history of the area, and records the Indians he encountered in the banks of the Jutaí.

By the time they started for the Jutaí, the wet season was nearing its peak, and not much dry ground was available for collecting since the forest was flooded. Trail's first impressions about the Jutaí were reported in his diary as such:

> "The Jutaí is much narrower & is as muddy as the Rio Juruá. The bends are very numerous, seldom a mile long & turns are frequently very abrupt, with very narrow necks of land to separate them. The water is clear, but brown... The banks are very low at present about 2 feet above water or less, while the trunks bear the high water-mark 10 or 23 feet from the ground. "Ygapo" [sic] borders both banks composed of trees characteristic of such localities, Aripari, Seringa barriguda, etc. & Jauari palms of great height, overtopping the forest. Assai palms are also abundant, sometimes singly, sometimes in small groups..." (Ms. 853: 106).

Trail also observed that, alongside the riverbanks, the "munguba" trees were the most abundant, forming a line along the margins. He also noted the absence, or scarcity, of the characteristic vegetation of the muddy rivers of Amazonia, as the "embaúba", "uirana", "bambús", "marantaceas", etc.

The expedition members used a local guide, who helped them obtain wood for fuel from the already semi-civilized Indians of the area. Among the tribes they met, Trail recorded the Catauena, Maraua and Baua, all they engaged in collecting salsa or rubber to change for goods with traders which went up river. Trail was told that the Mauára Indians had coming to the Jutaí from the Juruá to escape from the traders on that river who forced them to work. The Tucano and the Manjerona Indians were also reported to him as inhabiting the river banks, but were not seen by him. (Ms. 853: 108).

Only twelve settlements of rubber-tappers were reported by Trail from along the Jutaí, all of them found abandoned at the time of his visit due to the wet season. As reported in his diary: "most of them up to their roofs in the water". (Ms. 853: 111).

For Trail, his Amazonian experience ended when he left the Jutaí River. From that time on, he became solely concerned with the material he had collected and with his return to England. He handed over his official report to the leader of the expedition as soon as they arrived back in Belém; it was to be included in the final version of the expedition report, a text which was later edited by Brown and forwarded to the Company's agent, Mr. Pimenta Bueno.

While waiting for the ship which would take him back to England, Trail had the opportunity of strengthening his friendship with the Company's manager, Mr. Pimenta Bueno. In the occasion, the Brazilian presented him with a set of wood samples from the region, and a collection of photographs depicting Amazonian scenes, gifts which were much appreciated by Trail.

Trail's diary implicitly exposes the process of social transformation that was taking place in the lower Amazon at the time of his visit, but which had not yet reached the upper Amazon and its tributaries. At this latter part of the region, the physical, and resulting cultural isolation, led the inhabitants to ignore completely the established Brazilian laws and adopt morally unaceptable practices, such as the abuse of authority and the slavery and traffic of Indians. Another relevant social aspect evidenced by Trail was the eager search for rubber occurring at the time, which was disseminated throughout the lower Amazon, but was just in its very beginning in the upper Amazon.

In relation to Trail's field observations on the natural history of the region, the information contained in his diary is sketchy and somewhat limited in scope, particularly regarding the zoology of Amazonia. Nevertheless, his comments on the botanical features of the places visited are informative and still of use today, since they represent an invaluable record of the original marginal vegetation of the main rivers of the Brazilian portion of Amazonia.

Though we acknowledge the relevance of the information contained in Trail's travel diary, undoubtedly it is his zoological and botanical collections that constitute his foremost legacy to science. Of particular interest were the specimens obtained in places not visited before by other naturalists, material which later became an important complement to previous Amazonian collections. A detailed discussion on Trail's collections is given below in Chapter 4.

NOTES

1. See Weinstein (1993: 72).
2. During the time spent at Mr. Manoel's house, Trail had the opportunity of observing the treatment dispensed to the slaves of the house, having commented: "all of them seeming quite pleased with their position, not overworked and, well treated". It shoud be noted that, at the time, all slave children born after October, 1871 were legally free, and that slavery itself was on the decline, having become illegal in the Amazon Province in 1884. The abolition law, however, was only promulgated in 1888 (Loureiro, 1978).
3. These fish species are among the most common inhabitants of the Amazonian rivers.
4. The time Trail visited the region, Prainha was just a small settlement of 18 houses, contrasting with Santarém, which at the time was a thriving city with a well established

4. The time Trail visited the region, Prainha was just a small settlement of 18 houses, contrasting with Santarém, which at the time was a thriving city with a well established commerce and a Deputy house. It had nearly 310 houses, and a population of about 1,761 souls, being considered by the locals the "Queen of the Amazonas". (Ferreira Pena, 1869)

5. Miguel Antônio Pinto Guimarães, the Baron of Santarém. (Vasconcelos & Vasconcelos, 1918).

6. Besides the property on the neighbourhoods of Santarém, the Baron also owned a cattle ranch at Prainha. The latter was visited by Trail in 1873 (Ms. 851: 80).

7. Smith (1879: 153;174) reported the enterprise of a certain Mr. R. J. Rhome, in partnership with the Baron of Santarém, as the only successful American venture in the whole Tapajós basin. For Smith, however, the success of the American was not due to his merit alone, since his rich partner [B. Santarém] not only invested heavily in implements but also allocated 30 to 40 slaves to work in their project. This was in sharp contrast with the situation met with by other immigrants, who invariably had insufficient capital to invest and also had to depend on Indian labour for starting a business.

8. A detailed account on the American colony of Santarém is given by Smith (1879), who reported that, of the two hundred American immigrants, only 50 still remained by the time of his visit in 1874.

9. Gastao Cruls, a Brazilian physician and writer, visited the region 70 years after the arrival of the Americans and had the opportunity of meeting the only two descendants of the original settlers - the Riker brothers (Cruls, 1944: 276).

10. At the time of Trail's visit, Obidos and its surroundings was an area of cocoa production. The area was most probably a native cocoa ground, and was being exploited since colonial times. Ferreira Pena (1869: 19), on a report to the President of the Province of Pará, stressed that "the culture of cocoa is the favourite industry [sic] and exclusive of the Obidos farmers, and I do not believe that in any other places in the Amazon there are plantations like the ones found there". It was not surprising, therefore, that Trail did notice, with admiration, the cocoa farms which existed along the banks of the Amazon River at Obidos.

11. The Amazon river has its narrowest point in front of the city of Obidos, where its width is 1,982 meters. This narrow stretch of the Amazon is known as the "Garganta de Obidos" (Obidos' Throat) (Martins, 1944).

12. Trail regarded Sousa's work as remarkable for the miscellaneous nature of its contents. From this work, Trail took information on folklore, as well as on the use of some useful plants by the natives. (Ms. 852: 51).

13. The Brazilian "Companhia do Amazonas", later the British Amazon Steam Navigation Company, used both their own engineers and the Government's officers to survey areas of interest. As reported in one of the documents sent by the Company's manager, Mr. Pimenta Bueno, to the President of the Province of Pará in 1877: "... for more than a year the first Lieutenant of the Imperial Brigade, Augusto José de Souza Soares de Andréa, has been exploring the tributaries of the upper Purús, in what the Company has spent about 30,000$000" (thirty thousand Contos de Réis, about £2,200) (Pimenta Bueno, 1877).

14. Sousa (1873: 96) reported that, until that time, it was estimated that over 2,000 slaves had already escaped form their owners and had settled along the banks of the Trombetas and Curua rivers.

15. Morgan's expedition was scientific in nature and brought, in 1871, eighteen students from Cornell University to study, among other things, the Carboniferous deposits of the Rio Tapajós and the Devonian terraces of the Ererê (district of Monte Alegre). In the following year, C. F. Hartt once again visited the lower Amazon, but had at the time, however, his disciple Orville Adalbert Derby as his single companion.

16. During his travels throughout the Amazon, Trail learned of several other plants which were used to poison fishes. At the Rio Maués, for instance, he observed the preparation of a fishing operation in which the shrub "cunambé" (*Phyllanthus piscatorum*) was utilized. Trail recorded this event as follows: "the leaves are pounded up with farinha (manioc powder) which is thus well soaked in the juice, the crumbs are thrown into the river, the fishes eat them and are poisoned" (Ms. 852: 107).

17. The Mundurucús, who constituted a fierce tribe at first, became allies of the Portuguese from the end of the XVIII Century on, having even collaborated with the Brazilian Imperial Government during its confrontation with the the rebels of the "Cabanagem" Revolt in the early XIX Century. Semi-civilized Mundurucús were used as labour force in the Amazon region since the end of the XVIII Century, a situation that apparently remained unchanged during the whole XIX Century, as suggested by a letter sent in 1882 by the then President of the Amazon Province, José Lustosa da Cunha Paranagua, to his father in Rio de Janeiro: "... I intend to go to the Abacaxis and ... rivers, where there are camps of the Mundurucús Indians. They are useful for labour, and I look forward to contract some for public work here in the Capital [Manaus] and thus overcome the lack of working hands in the region". (Paranaguá, 1882; unpub. let. in the Archives of the Museu Imperial, Petrópolis).

18. The region of the Rio Negro experienced a brief period of development during the XVIII Century, when catholic missions established themselves along the river banks. The settlements, however, started to decline by the mid-eighteen Century, as a result of a series of official acts instituted by the Portuguese Government which included, among other measures, the expelling of the Jesuits from the Amazon region. During the XIX Century, all travellers who visited the region noted the state of abandon referred to by Spruce and Trail. When the Companhia de Navegação do Amazonas decided to inaugurate a regular line to ply the Rio Negro, the Company's engineer in charge of studying the feasibility of the enterprise produced a most unfavourable report based on the adverse conditions he observed in the region (Report presented to the President of the Amazon Province, Herculano Ferreira Penna, by the engineer Joao Mamede Júnior, 1855; unpublished manuscript in the Biblioteca Nacional, Rio de Janeiro). In spite of the negative perspectives, the Company decided to operate a regular line to the Rio Negro, even if not counting on immediate revenue. As pointed out by Bittencourt (1957: 81), however, the objectives of the enterprise were much more political than commercial, the line being acctually established to assure Brazilian sovereignity in the region.

19. In his talk to the Aberdeen Medical Association, Trail reported the following diseases as the most common in the region, having associated them with the way of life of the locals: aguae, rheumatism, fever, diarrhoea, colds, ophthalmia, lung diseases, venereal diseases, leprosy, beriberi. He also mentioned that medical assistance was in no way available to the inhabitants of the region (Ms 853: 165).

20. Trail's notebook, presently deposited at the Archives of the Royal Botanic Gardens includes Manoel's note to A.R. Wallace. It was written in a broken Portuguese by Trail, translated as: "Caburi, Rio Negro, 1st July 1874, Mr. Alfred Wallace, I very much cherish knowing about [your] health and happiness. I feel sorry for not having sent you a letter. Since I now find the occasion to send you my regards through a friend of yours, I [do] send them now. I am still alive in this world. I am the same as when I served you. Manoel Ricardo Antonio de Cimao"

21. Bittencourt (1957: 96) records the British S.S. *Maiard* as the first steamship to arrive in Manaus direct from Liverpool, in 30th April 1874.

22. The plant collection obtained by the German botanist G. Wallis was destroyed in Berlin during the Second World War (Prance, 1971: 63).

23. Although the Rio Purús had already been investigated along most of its length by the Brazilian João Cametá and an explorer known as Serafim, it is the 1860 expedition of the Brazilian Manoel Urbano that has been cited in the literature as the first to explore the river. Another Brazilian who explored the Purús is Joao Martins da Silva Coutinho, who sailed the river in 1862 (Correia Filho, 1944: 180).

24. The skin disease of the Paumaris Indians cited by Trail is now known to be a spirochaetosis caused by the bacteria *Treponema carateum*. Trail described the development of the disease as follows: "It first appears in the children when 18 months old ... is in the form of shallow ulcers which extend irregularly and remain open for a considerable lenght of time. On healing they leave large pale spots which are very conspicuous on the dark skin. To render them less conspicuous they are tatooed a dark bluish-gray ..." (Ms 853: 168).

25. Running away from a prolonged drought that was devastating Northeastern Brazil since the mid-1860's, and encouraged by the demand for labourers for the rubber business, a great number of immigrants from Northeastern Brazil entered Amazonia after 1877. They first penetrated the upper Amazon to explore the large tributaries such as the Purús and Juruá. It is calculated that, in 1879, the Purús area alone had already a population of 25,000 souls (Correia Filho, 1944: 180).

CHAPTER 4. TRAIL'S CONTRIBUTION TO THE NATURAL HISTORY OF AMAZONIA: COLLECTIONS AND TECHNICAL PUBLICATIONS

4.1. Botanical collections

Before leaving England for Amazonia, Trail paid a visit to the Royal Botanic Gardens at Kew, and settled with its director, Dr. Joseph Hooker, an arrangement of sending botanical specimens from the Amazon region. Such agreement, it should be said, was only made possible because Trail had been authorized by the Amazon Steam Navigation Company to freely collect scientific specimens during his survey work in Amazonia.

As soon as Trail arrived in the Amazon region, he began collecting botanical material, which he actually did not only for Kew, but for friends specialized in groups such as algae and fungi as well (see below).

While in Santarem, on the 3rd January 1874 and nearly three months after having arrived in Amazonia, Trail wrote his first letter to Hooker. In it, he informed on the material he had already collected, and excused himself for not having accomplished all of Hooker's requests due to some problems he had encountered:

"As regard sections of trees, Mr. Brown ... specially to look after & to be responsible for expenses incurred, is of opinion that our instructions do not allow of incurring the expense of sending such home, as he considers that the Board empowered is only to send dried plants. If you think it worth paying their carriage I shall try to get specimens of any sorts which you think it would be desirable for the Museums at Kew to have. Owing to the difficulty of getting labourers here it is difficult to get a tree felled when wanted, so I have not got specimens of the commercial woods yet." (Appendix, III, letter nº1).

Twenty one days later, i.e. on the 24th January 1874, Trail wrote again to Hooker (see Appendix III, letter nº 2) to notify him of his new mailing address in Belém, and inform that he was sending the specimens collected so far. In this same letter, he also revealed that he had not been able to collect seeds of the rubber-tree *Hevea*, as Hooker so much desired, because the species was not yet in fruit.

Trail's correspondence suggests that the main interest of Kew's staff was for samples of trees which presented potential for commercial use and, most of all, for seeds of *Hevea*. As is well known, the prime interest of the Royal Botanic Gardens, Kew, turned to Economic Botany from the time it became a State Institution in 1841.[1] The Museum of Economic Botany, mounted in 1848, was a place "where specimens of useful plants were avaiable for study and reference" (Brockway, 1979: 83), a clear indication of the future designs of this already prestigious scientific institution. For a detailed account on Trail's role in the process of the transfer of rubber-tree seeds to England, see Sub-chapter 4.3 below.

Even if not having yet heard from Kew, Trail continued to collect botanical specimens and send them to Kew, which he did with the aid of the Company's agent in Belém, Mr. Manoel Pimenta Bueno. Along with the specimens, Trail always included information on the material shipped, and a preview of his next steps.

The first replying letter from Kew reached Trail in July 1874, at a time he was already in Manaus waiting to start his five months journey up the upper Amazon (Solimões). From the letter, Trail learned that the material sent had arrived in perfect condition, and had very much pleased the staff at Kew. Since the letter included no further requests for samples of commercial trees, Trail decided to abandon this

assignment. In answering this first letter received from Kew, Trail demonstrates his contentment at the good news received:

"I was much pleased to learn from your kind note that the first lot of plants to Kew arrived in good order, and that you were pleased with them especially as I despatched them in fear of their turning out comparatively useless, and also of their being spoilt on the way by mould as the rainy season had begun before they left Pará..." (Appendix III, letter nº 5).

It should be emphasized that, besides Kew's role as a cultivator and propagator of plant species of economic interest, it also functioned as a centre of systematic botany. At the time, it already housed an extraordinary exsiccate collection of plant species from all over the world which, as is true for all such scientific collections, is fundamental to any systematic study. In such way, the collection such as that meticulously gathered by Trail in places never previously collected, represented a most precious asset.

While still in Manaus, and just before embarking for the last leg of the expedition, Trail decided to dispatch all the material collected so far to Kew and Aberdeen, since he would not be able to do it from the remote places he would visit. In this respect, he wrote on the 24th August 1874 to Dr. Daniel Oliver, the Keeper of Herbarium and Library, of Kew, informing about the material he was sending, and next journeys he was participating in.

" I send this to let you know that I am to send off another bundle of dried plants, palmstems & c by the steamer which leaves Manaos on the 25th ... I shall address them as previously to the care of Snr. Bueno the agent of the A.S.N.Co. in Pará, I have no doubt that they will be forwarded by him as soon as possible." (Appendix III, letter nº 6).

The botanical material obtained by Trail during his journey up the upper Amazon, specially the palms, algae and fungi, turned out as one of the most important he gathered, since most of the places sampled were entirely unexplored from a botanical and zoological point of view. For his contentment, all of this material collected arrived safely in Kew, and was later studied by him and other specialists.

When one considers that the botanical material obtained by Trail in Amazonia was gathered during his spare time from his obligations with the expedition, his talent as a collector becomes apparent. Such ability accounts for his collections representing an essential, even if far from complete, representation of the Amazonian flora, which should therefore be regarded as scientifically relevant. Trail's collections includes a wide spectrum of taxa, ranging from the most primitive groups (Thallophyta and Bryophyta), to the advanced Gymnospermae and Angiospermae. They add together more than 1,800 species, among which several were later revealed to be new to science. The plant group best represented in them is the palms which, not surprisingly, is Trail's favourite.

The collections of freshwater algae, fungi and lichens were sent from Amazonia directly to the specialists concerned; the remaining plant groups were forwarded to the herbarium of the Royal Botanic Gardens, in Kew, each time a sizeable volume of specimens was ready for shipping. (see Appendix II).

Thallophyta and Bryophyta collections

Trail's collection of Amazonian algae was studied by George Dickie who, at the time, was Professor of Botany at Aberdeen University and keen on the study of this group. The collection included material obtained in the wide area extending from the Amazon River estuary to the Javarí River, in the Brazilian border with Peru. The richest lots were obtained at the Purús River, and at the city of Manaus.

From the 289 species of algae collected, eleven were revealed to be new to science, and six proved to be new varieties (Dickie, 1881). The whole of Trail's collection of Amazonian algae, which had been incorporated to Professor Dickie's collection, was bought by the Natural History Museum in 1882, when Dickie died.

The collection of lichens was partially passed by Trail to Dr. James Stirton, a medical doctor settled in Glasgow with a keen interest in the study of lichens and mosses. Based on the material handed over to him by Trail, Stirton published a paper in which he described 12 new species of lichens from Amazonia (Stirton, 1877). Later, on a paper on the lichens which grow on living leaves, he described 26 new species collected by Trail in the upper Amazon (Stirton, 1878). A part of Stirton's collection of lichens (including Trail's Amazonian material) is now deposited at the Natural History, Art Gallery and Museum, in Glasgow; and the remainider of the collection is deposited at the Natural History Museum, London.

When still in Amazonia, Trail dispatched to Kew some specimens of lichens mixed up accidentally with other plants. Back in Aberdeen, on the 1st November 1876, he addressed a letter to Hooker (Appendix III , letter n0.13) asking him to forward the

specimens of lichens in reference to Stirton, in Glasgow, since he already had with him part of the Amazonian lichen collection. The material, however, was never sent to Stirton and, in 1892, while still in Kew, it was studied by the German botanist J. Mueller (1892). The lichen material referred above was collected in the upper Amazon, and includes 40 species, seven of which were unknown to science (Mueller, 1892).

Trail's collection of Amazonian fungi was studied both by Rev. Miles Joseph Berkeley, mycologist and Rector at Sibbertoft, Leicestershire, and Mordecai Cubitt Cooke, a botanical collector who later became in charge of the lower cryptogam collection of the Royal Botanic Gardens, Kew. The collection included more than one hundred species, of which 36 were described as new (Berkeley and Cooke, 1876). Trail's fungi collection is now deposited in the herbarium of the Royal Botanic Gardens, Kew.

The Hepaticae and Musci collections obtained by Trail in Amazonia were both lost, as he reports in his diary (Ms. 853: 228).

"A considerable collection of these plants was besought from me by Prof. Dickie to be intrusted to the Rev. John Fergusson, who wished to have the opportunity of examining them & undertook to determine them, & to supply a list & report on them, he to retain a set of specimens, & to return the rest. Accordingly I handed to Professor Dickie in 1875 all specimens of these groups collected by me in Amazonia, & was informed by him that he had forwarded them. Mr. F. was then a keen student of Scotch mosses, but became slack, & fell out of intercourse with former correspondents. Dr. John Roy, with whom he had undertaken to collaborate in the production of a new flora of N.E. Scotland, & who had sent to him *for revision* the greater part of the M.S. of the work, told me that he could get no reply to repeated letters. Prof. Dickie died in 1882, & I did not know Mr. F. personally, & could get no information as to the progress, if any, made with my collections. Dr. Roy died after some years, not having recovered his M.S. J.F. died in **** [sic], but only in 1909 I learned that he had left (with) directions to his executors that all his collections & M.S. were to be burned; & that with his own were destroyed all lent to him, included Dr. Roy's M.S. & my mosses & hepatics."

Collection of vascular plants

Trail developed a keen interest in the study of palms while in Amazonia, and thus took for himself the task of studying the palm collection he obtained in the region. Before him, two other British naturalists who had visited the Amazonian region also collected palms and published papers on them: Alfred Russel Wallace (1853) and Richard Spruce (1871). During his stay in the region, Trail utilized largely the works of these two naturalists, particularly the one by Spruce, as a basic source of information for identifying his palm specimens.

When Trail got back home to Aberdeen, he had not yet been formally authorized by the Company to divulge information accumulated during the expedition. This meant he had to obtain permission even to publish on the material he had collected himself. In this way, when Hooker offered to intervene for the sake of having Trail's results published, the proposition was gladly accepted by the latter. In a reply letter dated 22nd April 1875 to Dr. Hooker, Trail wrote:

> "In answer to your kind offer of assistance in obtaining the consent of the Directors of the A.S.N. Company to my undertaking the examination of the palms collected by me in Brazil I shall be very glad of such help if I find difficulty in gaining my request, & I do not doubt that at your recommendation they will agree to my doing so." (Appendix III, letter nº 8).

On the 24th June 1875, the Amazon Steam Navigation Company sent a letter to Kew giving the permission required, and announcing the satisfaction of its Directors of learning of the scientific importance of the material collected by Trail in Amazonia:

"I am instructed by the Directors ... to say that they are very pleased to learn that the specimens collected by Mr. Trail are of so much value and are so highly appreciated by yourself than whom no one is better qualified to judge." (Appendix III, letter no. 11).

Duly authorized by the Company, Trail published a work on Amazonian palms, describing in it 1 new subgenus, 20 new species, 18 new subspecies and 36 new varieties (Trail, 1876-77). The work also included justifications for his decision of synonymyzing species and subspecies previously described by other authors.

The publication of Trail's monograph on the palms of Amazonia had a negative repercussion in Brazil due to grave accusations against him made public by a Brazilian botanist - João Barbosa Rodrigues -, regarding authorship priority for some of the species described by Trail. The controversy regarding Trail's descriptions of new species of Amazonian palms is discussed at length in Chapter 5. Trail's collection of Amazonian palms is deposited at the herbarium of the Royal Botanic Gardens, Kew, except for 160 specimens which were presented to the Natural History Museum, London, in 1876.[2]

The specimens of vascular plants other than palms obtained by Trail in Amazonia were deposited at Kew, where they have been studied throughout the years by a number of specialists.

Trail kept with him a catalogue of the specimens donated to Kew. In it, he kept records of the material under study and the names of the specialists who utilized them for taxonomic work. Trail's specimen catalogue is reproduced in Appendix II.

Examining Trail's catalogue, his preference for palms becomes evident. It also discloses the taxonomic groups better represented in his collection (see Figure 2 below).

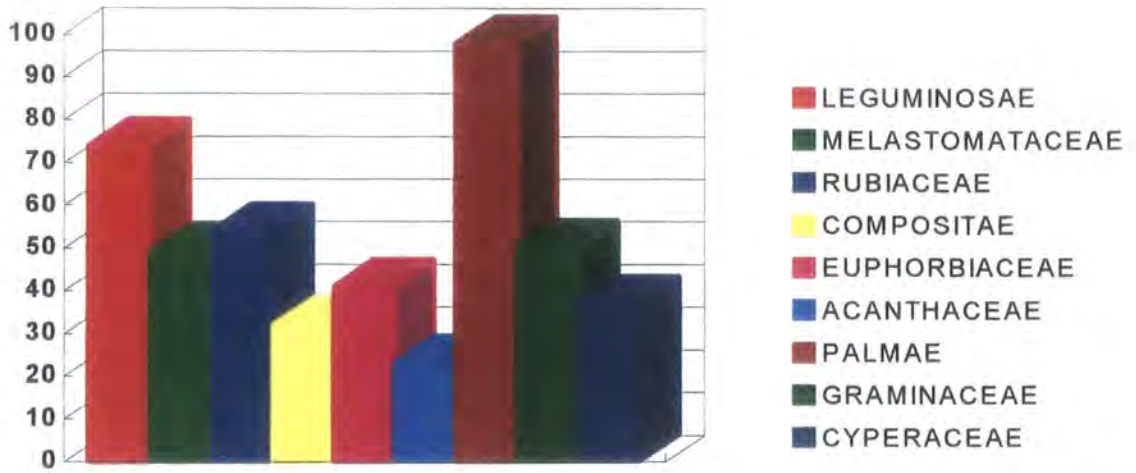


Figure 2. Families of vascular plants better represented in Trail's Amazonian collection. Data for the species included in each family was compiled from Trail's specimen catalogue reproduced in Appendix II.

Within the Division **Pteridophyta**, the Class Filices is the one better represented, with 80 species collected. Regarding the **Gymnospermae**, the Palmae (circa of 100 species collected), the Gramineae (circa of 50 species) and the Cyperaceae (circa of 37 species) are the groups better represented. Within the **Angiospermae**, the Leguminosae (circa of 74 species), the Melastomataceae (circa of 49 species), the Rubiaceae (circa of 54 species), the Euphorbiaceae (circa of 41 species), and the Compositae (circa of 32 species) are the families better represented.

Ducke *in* Sampaio (1944) referred to the Leguminosae as the most important familly in the composition of the Amazon forest. He also commented on the economic potential of many species of the family for their timber. Of the 122 genera of Leguminosae known from the Brazilian Amazon region (Ducke, *ibid.*), more than a third

is represented in Trail's collection.

The locally common Melastomataceae is, as reported by Ferri (1980), remarkable for the association of some of its species with ants. Trail's collection also reflects his interest for this particular family.

Ducke (1948) called attention to an increase in the number of speciess of palms and Rubiaceae, among others, as one heads to the west in Amazonia. Trail's collection seems to support this notion.

In 1876, Dr. George Bentham, who at the time was associated with the Herbarium of the Royal Botanic Gardens at Kew, described a new genus and species (*Maderosperma trailianum*, Trail species no. 531 included in Appendix II), an Asclepiadaceae from the material collected by Spruce and Trail in the Rio Negro and in its tributary, the Rio Padauari (Bentham and Hooker, 1873-76). In 1878, Spencer Le Marchant Moore, then working at the Herbarium of the Royal Botanic Gardens at Kew, described a new species of a Leguminosae (*Swartzia amazonica*, Trail species 163 in Appendix II), based on specimens collected by Trail at Tonantins, in the upper Amazon (Trail Ms. 853).

In 1891, Alfred Cogniaux, a Belgian botanist, described in his monograph on the Melastomataceae four new species (Trail species 267, 287. 288 and 311 in Appendix II) based on the material collected by Trail at the lower and upper Amazon, and later deposited in the Herbarium at Kew (Cogniaux *in* de Candole (ed.), 1891).

Besides Trail's interest in palms, he was also involved with the collecting and observation of plants of the family Melastomataceae which bear ant-tenanted bullae on the leaves. While studying the species collected, he took the initiative of naming one of

them as *Tococa capitata*, a name which was later followed by A. Cogniaux when studying the group. Trail also named and described an additional species - *Tococa longifolia* -, having deposited the manuscript at the Herbarium, Kew (Trail Ms 853: 199).

Trail had the intention of determining the specific connections between the bullae and the ants. This is indicated in his first letter from Amazonia to Kew, written in the 3rd January 1874:

"As regards the species of Melastomaceae bearing bullae on the leaves I have found one of which I take to be Myrmedone formicaria. This one is common both at Monte Alegre & at Prainha. In regard to both species I must say that after careful observation I am quite at a loss to determine the exact connection between the bullae & the ants, of which at least 3 spp. inhabit them. Neither plant seems specially liable to the attacks of other insects, in fact if anything they are more free from such attack than most other plant here.

The leaves of Myrmedone frequently bear hardly any trace of bullae even on the same twig on which occur largely developed bullae, & the same holds in regard to the other plant, as maybe seen by specimens which I shall send home. Ants are usually to be found in those on M. formicaria, but not by any means constantly, while sometimes they are taken possession of by solitary bees & wasps.

The other plant is still more puzzling. Of it I have as yet seen only 2 bushes. In one of them every bulla was tenanted by ants; on the other not one was so occupied though the bulliferous leaves bore numerous small ants nests on their under surface, commonly just over the orifices (see herbarium). I have also found hollow swellings inhabited by ants on the steam of a shrub (also in the herbarium) near Pará, at Erere, & at Prainha; & also ants inhabiting swellings in the twigs of a species of Cassia? but of these last I lost my specimens". (Appendix III, letter no. 1).

Two decades earlier, Richard Spruce had similarly paid attention to ants inhabiting plant-structures in the Amazon, but was unable to establish any plausible explanation for the interrelationships between the ants and the plants. Like Spruce, Trail was unable to detect any particular structure in the plants to attract, trap or induce the insects to enter the plants. He concluded, therefore, that the ants occupied the plants merely for protection against predators (see Appendix III, letter no.7). Sixteen years later,

at Kew, Trail commented with Lieutenant-Colonel Prain, then the Director of the Royal Botanic Gardens, that he had observed a few cases of plants of the genus *Tococa* in Amazonia which, in spite of bearing moderately developed ant-dwellings, had no ants on them. He added that, probably due to the absence of ants, these plants were being damaged by herbivorous pests. Years later, Alfred R. Wallace (*in* Spruce, 1908) recorded the relevance of Trail's observations, adding that he should be acknowledged by his breakthrough in the process of understanding the benefits of plants being tenanted by ants. Wallace also commented that Trail's conclusions confirmed previous observations of other naturalists such as Belt (1874), who suggested that the primary function of the honey-glands of ant-tenanted plants was to attract ants which, in turn, would function as protectors against predation.

In 1908, the Royal Botanic Gardens, Kew, published a monograph on the Cyperaceae whose author, C.B. Clarke, had spent twenty years in the Herbarium working with the classification of this family. The work, which was left in draft form at the time of Clarke's death in 1906, includes descriptions of four new species and one new variety (Trail's species 1179, 1191, 1202, 1204 and 1205 in Appendix II) collected by Trail in the Amazon region (Clarke, 1908).

Other species were also described by specialists who were, at the time, studying the groups collected by Trail (see Trail's species 122, 508, 638, 770 and 1384 in Appendix II).

For the rest of his life, Trail maintained regular contact with the staff at Kew, especially with Joseph Hooker. The exchange of information between them, mainly on

the taxonomy of palms, can be inferred from Hooker's correspondence (see Appendix III, letter n0. 16).

Finally, it should be mentioned that Trail built a well-established reputation with Joseph Hooker and other researchers at Kew throughout his career. Such status was mainly due to his seriousness and professional reliability. And, undoubtedly, to the scientifically relevant and well prepared collection made by him in Amazonia.

4.2. Zoological collections

Despite Trail's prime interest in botany, the collecting of zoological material was never neglected. Specimens were collected as frequently as possible, what usually happened during the intervals of his official responsibilities. When on board, he wasted no time, taking advantage of every stop made to avidly collect specimens. The steamer, therefore, was always overcrowded with jars and living or dried zoological specimens, besides his plants and seeds. Two caricatures of Trail, sketched by his travel mate W. Lidstone, depicts moments of his frantic activities on board the steamer *Guajara* (Plate V, a and b).

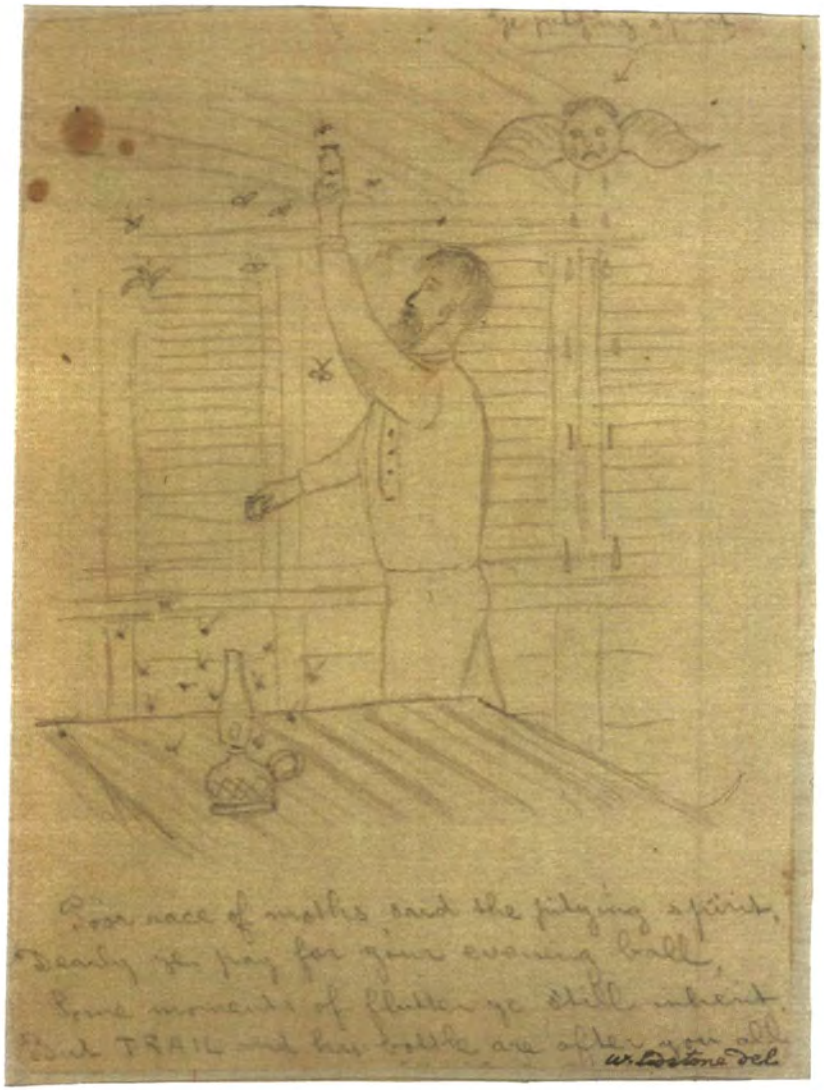


Plate V

a) Trail avidly collecting moths on board the Guajara. From an unpublished caricature by W. Lidstone (Archives of the Aberdeen University Library).

b) Trail surrounded by his specimens at his storage cabin on board the Guajara. From an unpublished caricature by W. Lidstone (Archives of the Aberdeen University Library)

Even if Trail's zoological collections may not be regarded as impressive, they were nevertheless much appreciated by the specialists, who confirmed their great scientific value. Although he collected selectively, having given priority to specific taxonomical groups such as butterflies (Lepidoptera) and beetles (Coleoptera), groups such as fishes, reptiles and mammals were not overlooked. His competence in handling specimens and associated data were also acknowledged, as suggested by the comments below by Butler (1877):

" Of the species collected [by Trail] many are very rare, and several are beautiful new forms; but the greatest merit of the collection consists in extreme care with which the precise locality, date of capture, and (where practicable) the habit of each specimen, is registred. With the assistance of such valuable information as Mr. Trail has given us, any collector may know positively where and at what time he is likely to obtain examples of the species here recorded".

The whole of the zoological specimens were dispatched directly from Amazonia to Trail's former Professor J. Nicol, of the Marischal College Museum, in Aberdeen. Only when Trail returned to Aberdeen in 1875, did he select the specimens to be distributed to the specialists concerned with the various groups represented.

Entomological collection

Not surprisingly, the insect collection was the most representative among his zoological material. Since Trail was a lad, his fondness of entomology had been

unbroken, he having even published three papers on the subject in the beginning of his career (see Sub-chapter 3.1.)

Trail brought back to Britan a significative number of insect specimens of numerous different taxa, several of which were later recognized as new to science.

The material of Lepidoptera comprised one of the largests of the zoological collections, including more than 800 species. Nearly half of the Rhopalocera (butterflies), and most of the Heterocera (moths), were taken during the five months he spent sailing along the rivers Purús, Juruá, Javarí and Jutaí. Among the species collected, many were found to be exceptionally rare, while several others were revealed to be exquisite new forms. The greatest merit of Trail's Lepidoptera collection was the extreme care with which he recorded the precise locality, date of capture and (where practicable) the life habits of the specimens collected.

Trail's Lepidoptera collection was deposited at the Natural History Museum, London. The first lot was presented by Trail to the Museum in 1877. It consisted of 274 species of butterflies and 166 of moths, 118 of which were unknown to science. In 1879, a further selection of 149 moths was incorporated to the collections of the Natural History Museum. This second lot included 55 types of the new species. In 1881, a third lot comprising 209 moths, including 180 type species, was passed to the Museum. The two first lots, and part of the third lot donated to the Natural History Museum, were studied by Arthur Gardiner Butler (1877; 1879), who was then working on systematic entomology under the supervision of Dr. J.E. Gray. A complementary study of the third lot was carried out by William Warren (1889), who at the time was working out the arrangement of the moth families Geometridae and Pyralidae at the Natural History Museum.

The (beetle) Coleoptera collection was formed by nearly 1,200 species and, in 1887, was similarly presented to the Natural History Museum.

A year after Trail arrived back in the U.K., he handed over his collection of the beetle family Staphylinidae to Dr. David Sharp. Sharp, then working as a medical officer at the Crichton Asylum in Dumfries, was a member of the Dumfriesshire and Galloway Scientific, Natural History and Antiquarium Society, by which he developed his entomological studies on the Staphylinidae. The beetles of this family, popularly known as "rove beetles", are predominantly tiny insects, usually showing a dull colouration (brown to black), with only a minority of the species displaying a somewhat more attractive colour pattern. The group, therefore, has no appeal to the general collector, for which reason it is usually poorly represented in collections. Trail's collection of Staphylinidae from the Amazon region comprised 77 species, 55 of which were unknown to science. It should be mentioned that none of the species Trail collected had been previously collected by Henry W. Bates, who had collected extensively in the region some 15 years before (Sharp, 1876).

At the time Trail handed over his Staphylinidae material to David Sharp, Bates also passed his Amazonian material of this same family to Sharp. Studying these two unique collections, Sharp was able to describe a considerable number of new species, which much contributed to the knowledge of the taxonomy of the family in the new world. By the time of Sharp's death in 1922, his entire collection was passed to his daughter, Mrs. Muir (Lucas, 1922).

Trail's collection of Amazonian bugs (Hemiptera), even if small when compared to the other groups of insects collected, may nevertheless be regarded as extremely

important. Of the species obtained, no fewer than 26 were found to be new to science (White, 1878). Understandably, the majority of the species of Hemiptera collected were water bugs, which were attracted by light and easily captured.

Trail handed over his Hemiptera collection to Dr. Francis Buchanan White, an independent botanist and entomologist from Perth, Scotland. White published two works based on Trail's material: one describing two new genera and seventeen new species (White, 1878); and the other listing all the new species already described in his former paper and including 12 additional new ones (White, 1879). The whole collection of Francis B. White, including the material collected by Trail in Amazonia, was donated by White to the Perth Museum in 1890.

In 1878, a work on the family Tenthredinidae (Hymenoptera) by the British entomologist Peter Cameron, included a new genus named after Trail (*Trailia*), and two new species described from his Amazonian material.

Arthropods other than insects

Of the additional arthropod groups collected by Trail in Amazonia, only the spider (Arachnida) collection was later studied. Trail's spider material was passed to the arachnologist Reverend O. Pickard Cambridge, who recognized among the material studied 11 species unknown to science (Cambridge, 1882). Even though Trail frequently referred in his diary to a collection of crabs he obtained at the banks of the Amazonian rivers, the specimens were never studied and were probably lost.

Miscellaneous taxa

Trail had the intention of taking to Britain samples of the most typical animal taxa of the Amazon region. For this purpose, he collected, prepared and shipped to Aberdeen skulls of mammals such as the primates *Cebus* sp., *Ateles* sp. and *Cebuella* sp.; the bats *Vespertilio* sp. and *Dysopes* sp.; and examples of the Carnivora, Rodentia and Marsupialia, among others. Also obtained were specimens of reptiles, which included various snakes and lizards, a specimen of the large alligator *Melanosuchus niger*, and turtles such as the common *Podocnemis expansa* and the bizarre "matamata" *Chelys fimbriata*. Additional groups represented were birds (four stuffed specimens and two skeletons), amphibians, fishes (one of his best collections among the vertebrates, as mentioned in Sub-chapter 3.2), crabs and snails. Trail's idea was to present the material to the Natural History Museum of the University of Aberdeen, the institution in which he had worked for years (see Sub-chapter 3.1). It appears that he achieved his goal, since the Aberdeen University Library has under its care a catalogue listing the species collected by Trail in the valley of the Amazon River from October 1873 to March 1875 (Special Collection, Ms 863). The catalogue includes the scientific name of each specimen (sometimes the common name as well), and the locality and collecting date of each. Most significant, however, is the fact that it gives the registration (catalogue) number of the Natural History Museum of the University of Aberdeen for each of the specimens.

Of the material mentioned above, however, all that could be located, and survives today, is a small box containing skeletons of different species of Amazonian fishes.

Regrettably, the rest of the material appears to have been lost. The extant material, deposited at the Natural History Museum of the University of Aberdeen (registration numbers 17118 to 17127), is composed of the following species (original nomenclature retained): *Carapus fasciatus*, *Mesonauta insignis*, *Prochilodus* sp., *Myletes bidens*, *Pimelodus* sp., *Rhamphichthys blochii*, *Crenicichla saxatilis*, *Anostomus fasciatus*, *Hemisorubim platyrhynchus*, and *Serrasalmus elongatus* (Plate VI). The most probable explanation for the disappearence of Trail's collection of "miscellaneous" animals is the inadequate conservation of the specimens, which eventually lead to their destruction along the years. As mentioned earlier in Sub-chapter 3.1, Trail had been in charge of the Museum of the University of Aberdeen until the time he travelled to Amazonia. When Trail returned to the University, however, he got involved with so many different activities (such as concluding his medical course, and studying his botanical material collected in Amazonia), that presumably he had not much time left for the Museum. To complicate things even further, two years after his return he was appointed Professor of Botany at the University of Aberdeen. Yet, he still managed to incorporate his Amazonian material into the Museum's collections. Trail's registratiom of his Amazonian material can be perceived from the catalogue mentioned above, and from the labels attatched to the fish specimens still extant.

Plate VI

The above specimens are the only which survided from Trail's collection of Amazonian animals sent to the Museum of the University of Aberdeen. Photo by M. R. Sá (1990).

4.3. Trail and the search for rubber seeds

Sir Henry Wickham was the major character behind the episode of the first successful transfer of rubber seeds to Britain in 1876, an event which has definitively linked his name to the history of 19th Century Amazonia. It is not the scope of the present study, however, to discuss either the episode of the transfer of the seeds, or the subsequent cultivation of the rubber-trees in Asia, since the matter has been discussed at length by various authors.[1]

Trail's role in the episode of the transfer of rubber seeds was irrelevant, and the information included herein is aimed only at documenting further the great interest of Kew in transplanting rubber-trees to a British colony, for which it mobilized British residents and travellers to obtain the seeds.[2] Trail's part in the affair also serves to confirm the notion that, by the 1870's, Brazilians were largely unaware of the negative implications involved with the removal of their natural resources. Such posture was in contrast with that followed by the Amazonian Andean countries which, already in the 1860's, had a protective law regarding the exportation of native plants.[3] In the specific case of rubber seeds, most Brazilians from Amazonia were confident of the inexhaustibility of their *Hevea* resources, and were unable to perceive that British plans to grow the species abroad were already under way.

Until the 1860's, the cultivation of rubber-trees had never been cogitated in Amazonia because of their local natural abundance. As the demand for rubber grew and exportation increased, however, a few Brazilians recommended to the Government (though unsucessfully) that cultivation of rubber-trees should be encouraged in the

region.[4] To defend their views, they stressed that rubber was being extracted in a predatory way (exhausting one site after the next), a practice that was bringing no benefits whatsoever to the region (Reis, 1956: 90). In spite of the efforts of these far-sighted Brazilians to change the view of the politicians and ordinary people of Amazonia to initiate the cultivation of rubber, they were not successful.

An incident reported by Trail when exploring the Madeira River well illustrates the views of the Amazonian people regarding the cultivation of *Hevea*. When asking a local rubber collector if the cultivation of rubber-trees had ever been attempted in the region, Trail got the following answer from the surprised man: "no, they take so long to grow". Trail claimed that in time all the trees would be destroyed, but the man argued bade and added: " - there are enough of them in the forests ..., and ... all the people along the Madeira are rubber-gatherers, not agriculturists" (Ms. 852: 166). Such comments, instead of representing an isolated opinion, actually reflected the current views of the inhabitants of Amazonia. It is worth noting that Trail had always been fully convinced of the benefits of cultivating rubber-trees, having stressed in his report on the Rio Jutaí the convenience of having the species planted on the "igapós" (low lands) (Brown and Trail, 1886). Manuel Pimenta Bueno, the Company's agent in Belém, shared Trail's views on the matter, and was an apologist for the cultivation of the *Hevea* in the region. He and his brother, F.A. Pimenta Bueno, even published an article on the subject (Pimenta Bueno, 1882).

According to Dean (1989: 34), it was a report by the Brazilian João Martins da Silva Coutinho, a member of the 1867 Universal Exposition in Paris, that draw the attention of James Collins, then Curator of the Pharmaceutical Society of London, to the rubber business. Coutinho's report stressed the superiority of the Brazilian *Hevea*, and

estimated the cost of running a rubber-tree plantation. Two articles published later by Collins on the subject (Collins, 1868, 1869) ended up by calling the attention of Sir Clements Markham, a representative of the India Office, who promptly became interested in transferring rubber seeds to the British Colonies in Asia as had been done before with cinchona.[5]

When Trail met Wickham in Santarem in 1874 (see Sub-chapter 3.2 above), he knew nothing of his engagement to collect rubber seeds for Kew in response to a joint request by Sir Joseph Hooker and the British Consul in Belém, Mr. Thomas S. Green. Since Wickham's assignment was still being settled, he did not refer to it during his encounter with Trail and his colleagues. The final arrangements between Wickham and Kew were only settled in April 1875 (Dean, ibid.: 40).

Similarly to Wickham, Trail had also been insistently asked by Hooker to send rubber seeds to Kew (see Sub-chapter 4.1). As a consequence, he made several attempts, all unsuccessful though, to obtain the seeds during his journeys throughout the Amazon region. At one time, at the Jutaí River, a fairly good number of seeds was obtained, but not a single one survived.[6]

Because of the difficulties for obtaining the much valued rubber-seeds, Trail tried to get them through the Company's agent, Mr. Pimenta Bueno. While in Belém in February 1875, Trail welcomed a kind offer of collaboration from Mr. Bueno, and asked his assistance for obtaining some *Hevea* seeds (Ms. 853: 149). In May 1875, after Trail had returned to Britain and settled in Aberdeen, Pimenta Bueno mailed him a box of seeds of the Amazonian rubber-tree.[7] The box arrived safely in Aberdeen a month after

leaving Belém, and Trail forwarded it immediately to Kew to have the seeds planted at once. In a letter sent on the 18th June 1875 to Dr. Daniel Oliver, at Kew, Trail explained:

" I have this morning forwarded by mail, addressed to you, a boxful of seeds of the Pará rubber or Seringa tree (*Hevea brasiliensis* ?) which reached me yesterday afternoon. They were forwarded to me from Pará by Sr. Pimenta Bueno... as I know the importance of having them planted as soon as possible. Perhaps it may be of use to mention that the trees drop their seeds either very shortly before or while the forest is flooded with the river water & that possibly the seeds require to be steeped for some time..." (Appendix III, letter no. 10).

Trail's efforts were in vain, however, since in July of that same year he had the disappointment of hearing from the staff of the Royal Botanic Gardens, at Kew, that the seeds he had sent "turned out too badly to be germinated" (Appendix III, letter n0. 12).

Kew finally obtained the rubber seeds from Wickham in 1876, and in this way sucessfully completed another of its assignments in Amazonia. Earlier, it had already transferred cinchona seeds and young plants from Ecuador to Britain's colonial botanic gardens (see Brockway, ibid.).

Concluding, it should be mentioned that even if the transfer of rubber seeds to Britain seemed inevitable, Wickham's task was greatly facilitated by the conjuncture of the epoch. This included factors such as the absolute lack of control on plant trade[8], and the fallacious judgment of most of the Brazilian Amazonians, who regarded their native stocks of rubber-trees as eternal.

NOTES

1. See among others, Brockway (1979), Santos (1981), Dean (1989) and Weinstein (1993).

2. Dean (1989) cited Charles Farris, a British citizen who lived for some time in Cametá, near Belém, as the first to be requested to send rubber seeds to Britain (which he did with no positive results). Besides H. Wickham, the others were: a Bolivian named Ricardo Chavez, who collected the seeds at the Madeira and sent them to London in July 1875; and Robert Cross, a Kew gardener who went to Belém in 1876 to collect the seeds. A new personage to be added to the list is J. Trail, as revealed by the present study.

3. At the time, the only imposition by the Brazilian Government in relation to natural products collected in the country was the observance of a custom's regulation, which established that: "products collected in the Empire to be sent to natural history cabinets by professors commissioned by governments, foreign academies, or credited by their diplomatic agents or consuls, could be dispatched without inspection of the packages, it being only necessary that a declaration is presented by the naturalist ..." (Regulamento das Alfândegas e Mesas de Rendas, Decree 2.647, of 19th September 1860).

4. The most enthusiastic apologists of the cultivation of *Hevea* in Amazonia were: the President of the Province of Amazonia, João Batista de Figueiredo Tenreiro Aranha; the engineer and geologist Joao Martins da Silva Coutinho; the Chairman of the Amazon Steam Navigation Company, Manoel Pimenta Bueno, and the President of the Province of Pará, Pedro Vicente de Azevedo. For more information on the subject, see Reis (1956).

5. For details on the cinchona transfer; see Brockway (*ibid.*).

6. Trail had collected not only seeds, but also six young rubber-trees. He also had a small rubber-tree cut down to take cuttings for grafting, in which he was unsucessful (Ms. 853: 120-121).

7. By the time Pimenta Bueno sent rubber-seeds to England, he was unware of the real intentions of the staff at Kew. He did not know that, by doing so, he might have helped to introduce the rubber-tree in Asia and thus precipitated the loss of the monopoly of the rubber trade for the Amazon region.

8. Trail spotted a boat loaded with orchids in Manaus, in 1874. Having inquired the owner about the destiny of the plants, he was told that the epiphytes were being shipped to England, where they would be sold. This indicates that a commerce of exotic plants already existed in Amazonia at the time, and implies that no control from the local authorities was exerted over it. In fact, it was only in 1955, when a Decree (37.884) regulating nature conservation in Brazil was sanctioned, that the trade of ornamental plants started to be controlled by the Government.

CHAPTER 5. THE IMPACT OF TRAIL'S WORK ON AMAZONIAN PALMS: A DISPUTE WITH THE BRAZILIAN BOTANIST JOÃO BARBOSA RODRIGUES

5.1. The development of the polemic

When, on the 21st January 1874, Trail arrived in the Amazonian city of Obidos, he could never imagine that a fellow he was to meet at the interior of Amazonia would change his scientific ambitions in the region, and subsequently even boost his professional life in Britain.

The day after the expedition arrived in Obidos, the local agent of the Amazon Steam Navigation Company's, Colonel Meirelies, informed Trail and his associates that a Brazilian botanist, João Barbosa Rodrigues (Plate VII), had just arrived from a trip upriver on board the S.S. *Manaus* for collecting palms and orchids. Interested in knowing what the Brazilian botanist was doing in the region, the members of the expedition paid him a visit at once.

Barbosa Rodrigues was from the capital city of Rio de Janeiro, and had been commissioned by the Brazilian Imperial Government to put together a collection of palms and orchids from the Amazon and Pará provinces. He had been collecting in the region since 1872, and had as his travel companions his wife and a servant.

However, after their acquaintance and a few early cordial meetings, which included a few collecting excursions together, a feeling of distrust started to build up

Plate VII

João Barbosa Rodrigues (1842-1909), the Brazilian botanist who Trail met in Amazonia in 1874, and with whom he had a dispute about the authorship of new species of palms. From a photo in B. Rodrigues' *Sertum Palmarum Brasiliensium* (1989 edition).

between BarbosaRodrigues and Trail. The outcome of the affair was a polemical article published in 1879 by Rodrigues, which he titled *Protesto -Appendice.* In this paper, B. Rodrigues claims for himself the authorship of several new species of palms he had described earlier, and which had been either improperly synonymized, or simply redescribed by Trail as his own species. The descriptions had been included in Trail's work on Amazonian palms, which was published in 1876-77.

So severe were the accusations by Barbosa Rodrigues against Trail, and so long were they maintained by the former botanist, that a thorough analysis of the matter is in order. With this aim, the accounts contained in Trail's unpublished diary, and the letters he exchanged with the staff of the Royal Botanic Gardens, are confronted with the published complaints of Barbosa Rodrigues for evaluating the validity of his protests.

The encounter

Trail, Brown and Cunningham (the interpreter) paid Barbosa Rodrigues' a visit the same day they were told about him. In his diary, Trail commented:

> "Barbosa Rodriguez looks rather over 30 & has the look (spectacles) & all of a German scientific man. He has just returned from exploring the Urubu River where he found a number of palms; he showed us a large number of careful paintings of palms & orchids he had made, of which he thinks that several are new species, but he has not seen any work on American palms except Martius' Palms of Brazil & Kunth's Enumeratio plantarum, both which he has here. He spent some time at Erere, and showed us some fossils he had picked up near a stream ... among them were Spirifer and ... (coral) indicating Carboniferous formation. He reads English well, but does not speak it." (Ms 851: 152).

In his *Protesto - Appendice* (1879: 8), Barbosa Rodrigues gave his own version of their acquaintance:

In the morning of a day of January 1874, I received the visit of 4 Brazilian friends who popped in to tell me about an English Scientific Commission that had just arrived in the city. They wanted to know if I knew anything about it, which I did not. Some minutes later, we saw 3 foreigners looking around, until one of them addressed us asking where they could find Dr. Barbosa Rodrigues's house. I then immediately introduced myself, and so did the British men. They told me that they were looking for me on behalf of Dr. J.D. Hooker, director of the Kew Gardens, to find out about my work on palms and if I would not mind showing it to them. Feeling honoured by having been remembered by such an illustrious person, I invited them in to see my drawings and manuscripts. After a while, Dr. Trail asked me if I had found any new species. Promptly I replied that I had found 34 new species up to that time, and hoped to find yet many more. Surprised at what I had said, they started looking at the drawings all over again, demonstrating a great interest in the new species. Before they left, Dr. Trail told me that from that date on he would consider the palms as his interest, and asked my permission to visit me again. After they left, I was severely criticized by my friends, who considered it foolish on my part to have aroused their interest on Amazon palms".

The acquaintance

Three days after they met, Barbosa Rodrigues paid back the visit. Trail recorded their second encounter on his diary:

"About noon Dr. B. Rodriguez called & sat for some time talking. Spruce's Palmae Amazonieae interested him [B.R.] greatly, specially as I pointed out to him one or two of the descriptions that agreed well with species of his own collecting. I thereafter accompanied him to his house to see the remainder of his paintings of palms, & had a long talk (in very broken Portuguese) with him on matters botanical, geological & otherwise. Among his books were a good many English works (chiefly Lindley's) which he reads easily. Dr. B. R. also showed me minerals & fossils found by himself on the Urubu & Jatapu Rivers; among the minerals were limestone uncrystallised & crystallised, Alum ... , & Iron pyrites. He had also several curious insects, among them 2 "Tananas" from the Jatapu". [1] (Ms 851: 155)

Ten days later, Trail called on Rodrigues to talk again about botanical matters. After consulting the copy of Spruce's work handed over to him by Trail, Rodrigues perceived that two of the species he regarded as new had already been described by Spruce. In his diary, Trail registered:

> After breakfast called on Dr. B. Rodriguez whom I found at home & with whom I had a long talk on matters botanical. Two of Spruce's species he regards as certainly the same as 2 of his supposed novelties. The "Tucuma uassu" is an undescribed species that he has named Astrocaryum princeps. He asked me to stay to dinner which I did, and was introduced to his wife, no beauty but hospitable. The cooking was much as at home. (Ms 851: 177)

By that time, a steadly growing companionship was developing between the Brazilian botanist and Trail. Rodrigues was a hospitable man, and made every possible effort to please his new acquaintances. He arranged two collecting excursions to show them an archaeological site and a lake near Obidos. He also named one of the palm species collected by Trail near the Caipuru Lake, in the Trombetas River, as *Bactris trailiana* (see Plate VIII). About those episodes, Trail wrote:

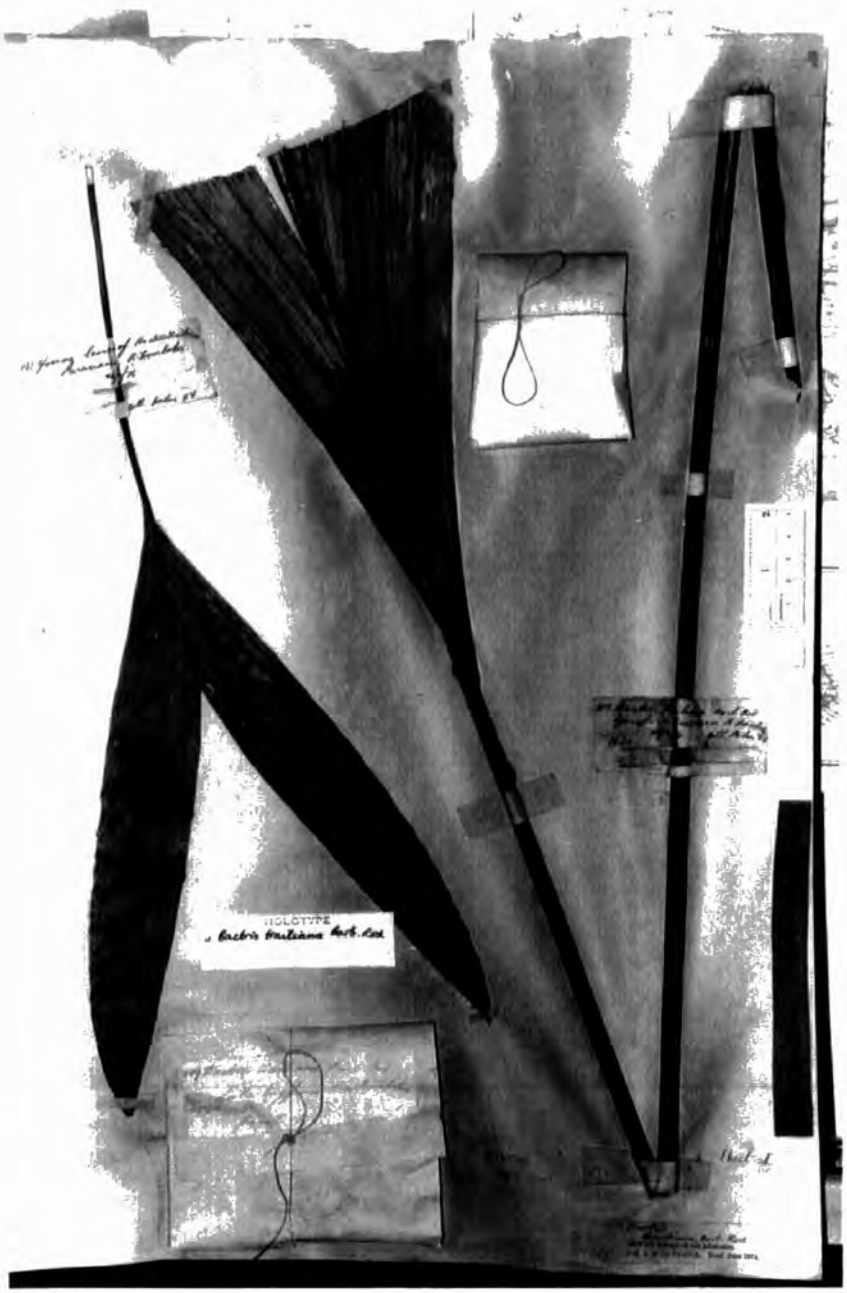


Plate VIII

The holotype of *Bactris trailiana* B. Rodrigues, deposited at the Herbarium of the Royal Botanic Gardens, Kew. The specimen was collected by Trail and later examined by B. Rodrigues, who identified it as new and described it. Photo by courtesy of the Royal Botanic Gardens, Kew.

"In the afternoon [9.II.1874] Dr. B. R. called on us and chatted for a good while about his experiences in travelling. He has experienced even greater annoyances than we, so that we have apparently not suffered more than Brazilians themselves have to. The lazy mode of paddling was quite familiar to him, and he also had found his men help themselves to his provisions on the journey... He gets about 1,650 pounds from the Brazilian Government to travel thro' Brazil as a botanist, but must pay all expenses. I showed him the leaf and fruits of the Bactris from the forest near Lago Caypuru; he came to the conclusion that it is an undescribed species and borrowed the specimens to paint them. He arranged to go with us tomorrow to show us some rocks on the top of the Serra da Escama (the hill E. of Obydos) bearing figures carved by Indians.

About 8 a.m. (10.II.874) Dr. B. R. came in and we set out together... ".(Ms 851: 179).

On the 13 February 1874, Trail reported:

" ... On my return to the house I found in it Dr. B. R. who had brought his painting of the Bactris & also the specimens. He has come to the conclusion that it is unnamed & has called it B. trailiana". (Ms 851: 181).

During the excursions organized by Barbosa Rodrigues, the Brazilian proudly displayed to the British his solid knowledge of the local flora. He was always willing to show the new species of palms he had named, and many others which only his trained eyes were able to spot in the forest. As Trail reported in his diary:

" After breakfast (21. II. 1874) Dr. B. R. called and asked whether we had been at the Lago the Obydos & offered to go with us today, so off we all went. The road lay over the rude bridge across the igaripé, & then soon reached the lake, & kept along its margin. It is really a swamp overgrown with Mauritia carana with occasiional open spots of water... with waterlillies, Bladderworts &. Along the shore at the open spaces are numerous houses tenanted by washwoman... We next passed thro' a bit of bush where *Astrocaryum acaule* abounded with ripe fruit. Dr. B. Rodriguez pointed out to me several plants of it with stems 5-10 feet high, & about 8 inches thick, belying its name. Here also ocurred *B[actris] jauari, A[strocaryum] gynacanthum, B. cuspidata & B. acanthocarpa.* At last we crossed a small stream, and reached a wood in which B. R. pointed out to me an *Iniartea* 20-60 feet high, the tallest ones having roots 3-5 feet above the soil. He has called *I. obidensis*, regarding it as distinct from *I. exorhiza* from its bearing 1 or 2 supplementary leaf ... at base of central pinnae. I cut & carried home a leaf and the sheathing column of a tree with stem about 20 feet high". (Ms 851: 184-185).

It is apparent from Trail's diary that, by that time, his interest in palms was steadily growing. Having learned with Rodrigues how to recognize the different palm species among the countless trees of the jungle, he shortly started to collect and make careful observations on palms wherever he went.

The mistrust

When, in April 1874, the British were leaving for a trip up the Trombetas River, the interpreter, Mr. Cunningham, politely offered a place on board to Barbosa Rodrigues. The Brazilian gladly accepted the offer. Trail, however, clearly demonstrates in his diary that, by that time, he was no longer feeling comfortable with the presence of the Brazilian botanist. In fact, it was precisely during this specific trip that Trail began to compete with Rodrigues for palm specimens. As mentioned by Brown & Lidstone (1878: 238):

"Both the botanists were especially interested in the subject of palms, and more particularly in the discovery of new species. There was quite a scramble for the first and best specimens, and for the honour of preparing the first description".

When they entered the Trombetas, B. Rodrigues started showing Trail several different species of palms. Trail reported in his diary:

"Among the bushes Dr. B. R. pointed out to me 2 species of *Bactris* (Palms), the one, called Marajá-uassu , a variety of *B. Maraja* with smaller fruits but talleer stem than the type, the other, called Curumú he has described as new species under the name *Bactris rivularis*". (Ms 852: 3).

Since the Brazilian was, by far, more skilled than Trail for collecting in the Amazon jungle, and also because he had been studying palms for much longer, he was always more successful in obtaining good specimens. Still, it did not take Barbosa Rodrigues long to suspect Trail's sudden interest on palms. As a result, from that time on, the suspicious Rodrigues decided to keep for himself his knowledge of the Amazonian flora. In short, the trip up the Trombetas was the turning point on Trail and Barbosa Rodrigues' relationship, and marked the beggining of the mistrust which developed between them.

After returning to Obidos, Trail and Barbosa Rodrigues only met again thrice. The first encounter occurred two days after they had arrived back in Obidos. Trail went to B. Rodrigues' place to examine the material collected on their trip up the Trombetas. However, the Brazilian botanist had not yet started his painting, having taken that time to rest. The second meeting ocurred after Trail's return from an excursion up the Rio Tapajós, on the 23rd March 1874. On this encounter Trail reported in his dairy:

"This forenoon I called on Br. Barbosa Rodriguez , & saw his paintings of the palms from the Trombetas, & then took him on board the *Beija-flor* and showed him my palms from the Tapajós all of which weere new to him, so I gave him leaves of all, and fruit of the *Lepidocaryum*". (Ms 852: 52).

The two men met for the last time in Belém, on the 24th February 1875, nearly a year later from their last encounter. About this meeting, Trail reports in his diary:

"I found Dr. B.R. at home & had a talk on palms & other subject of mutual interest. He showed me his paintings of his supposed new species; most of which seem decidedly different from the palms I have met with; but one or two I at once recognized as identical

with Spruce's species, specially Barbosa's *Cocos aequatorialis*, which is Spruce's *Maximiliana inajai*. Dr. Rodriguez refers it to *Coco* because of the nature of the pericarp of the fruits, of which he found abundant ripe near Manaus. He seems to me far too eager to make species out of mere varieties & even would wish to ignore the later works of botanists on American palms, depending for his information solely on Martius' ... & on Kunths' ... (Ms 853: 148)

The dispute

When Barbosa Rodrigues returned to Rio de Janeiro, which happened three months after he last saw Trail, he published a list of the palms he had collected during his three and half years in the Amazon region. There is reason to believe that Barbosa Rodrigues, not as a self-promoting manoeuvre but rather as a consequence of Trail's growing interest in palm taxonomy, hurried to publish the descriptions of his new species in order to affirm their validity and establish his authorship priority. For consolidating still further his authorship, Barbosa Rodrigues took the initiative of sending Kew a copy of his *Enumeratio Palmarum Novarum* immediatelly after its publication in June, 1875.

As soon as Barbosa Rodrigues' paper arrived at Kew, the Curators sent a letter to Trail in Aberdeen, asking if he knew about Rodrigues' collections. Trail was astonished when he learned about Barbosa Rodrigues' paper, since the Brazilian had not informed him of his intention of publishing his new species so soon. In a letter to Hooker dated of 10th July 1875, Trail expresses his impressions about Barbosa Rodrigues:

"I yesterday received a letter from Prof. Dyer, & today one from Dr. Oliver informing me that a pamphlet had been sent to Kew Herbarium containing descriptions of new species of palms gathered by J. B. Rodriguez in the valley of the Amazon and asking if I could give any information as to the nature of his collections. I was a good deal surprised to hear that he had published descriptions in as much as he told me in Para the day before I left Brazil that he intended to come to Europe to compare his descriptions with the various type specimens & descriptions in works to which he could not get access in Brazil, & that he

intended to defer publication until he could do so. ... he promised me a copy of his diagnoses of new species while I was in Para, & was to give it me there but deferred doing so till it was too late, & I have not since heard ... from him. I think it probable that his haste to publish has been due greatly to a fear lest I should anticipate him especially as Prof. Dyer informs me that all his new species are initiated with his own name. Of four species I gave him specimens at the same time ... diagnoses of them and the names which I attached to them provisional in their proving to be new species, as I found they were on examining them at Kew. These are: *Bactris inermis; B. syagroides; B. oligocarpa and B. elegans*. If he claims these as species of his own it will show that he is not overscrupulous in his dealings & seeks to attach his name to species by any means ...".(Appendix III, letter no. 12).

In 1876 and 1877, Trail published two papers on Amazonian palms, in which he described the new species he collected in the region, and reviewed the taxa described in previous works such as in the one by Barbosa Rodrigues (1875). In his works, Trail also described a specie of *Astrocaryum* (*A. rodriguezii* Trail) after Barbosa from specimens which had been obtained when they were collecting together in the Trombetas (Plate IX). This moment is described by Trail as:

"In the 2nd March, we reached the Igarapé Agua Fria ... & landed B. L. C. Mamedie, Dr. B. R. & myself ... & climbed a hill which rose almost from the edge of the river to a height of 200 feet. Near the top I noticed a palm which turned out to be an *Astrocaryum (A. aculeatum* of Humboldt, acording to Dr. B. R.) = *A. rodriguezii* Trail...". (Ms 852:)

Trail in this way was paying back the homage received from Rodrigues who had previously named *B. trailiana* after him.

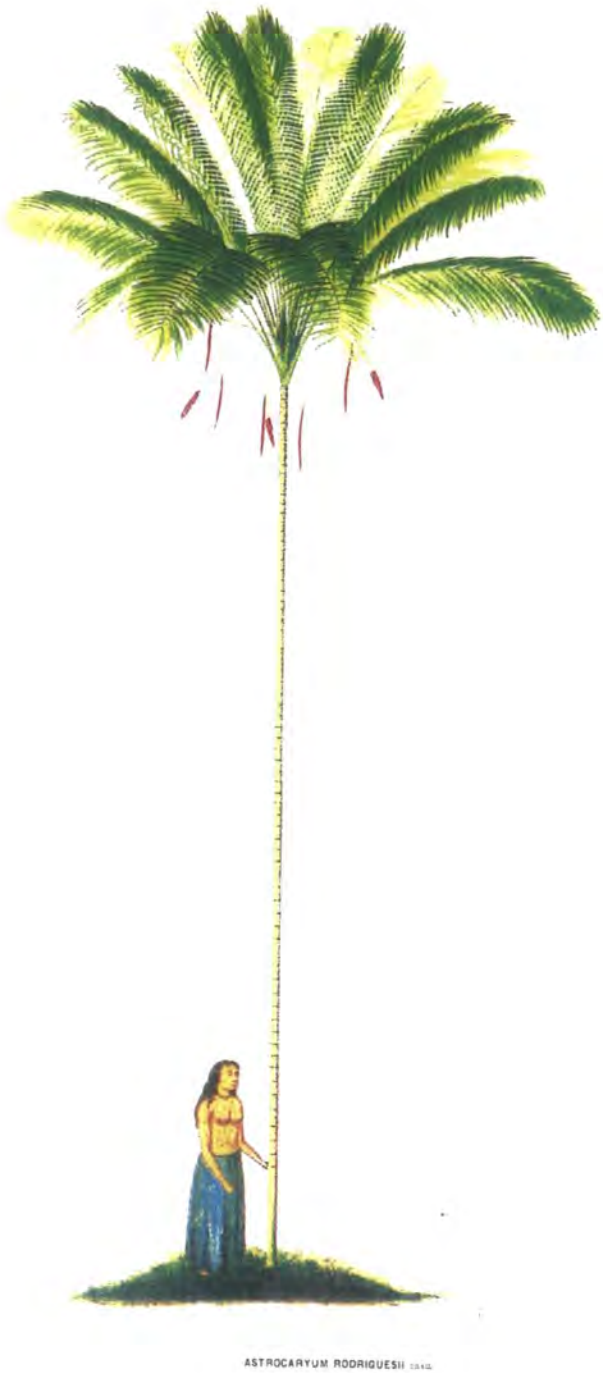


Plate IX

Astrocaryum rodriguezii Trail, described from a specimen Trail and Barbosa Rodrigues collected jointly in the Rio Trombetas, in 1874. The species was named as a tribute to B. Rodrigues. From a drawing by B. Rodrigues in his *Sertum Palmarum Brasiliensium* (1989 edition).

Trail's works provoked a prompt reaction from Barbosa Rodrigues, who showed all his indignation in a series of published protests regarding to some species described by Trail (see below).

Rodrigues' protest

In 1878, Barbosa Rodrigues received Trail's works on palms, in which B. Rodrigues' priority for the taxa he described beforehand had been simply ignored by Trail. Even more serious, however, was the fact that some of B. Rodrigues' new species were merely redescribed as new by Trail, without any reference to B. Rodrigues work. Taking Trail's attitude as an insult, B. Rodrigues protested rightaway at a meeting of the Instituto Histórico e Geográfico Brasileiro (Figueiredo, 1879), and later in various published works (Barbosa Rodrigues, 1879; 1882; 1888; 1903).

In his paper entitled *Protesto-Appendice*, Rodrigues described the episode as follows:

> In the *Journal of Botany*, vol. VI, 1877, Prof. Trail started his species descriptions about the genera *Bactris*... In the species number 18, Prof. Trail described the *Bactris elegans* as a new species, without the name of the author and, consequently, inheriting the authorship of the species. In the end of the description, he declared that this species had been published by me with a description that he had done for me.
>
> Let me explain the facts: after we arrived from the trip up the Trombetas River, Dr. Trail went to explore the Tapajos River with his British companions. He was very much interested on the palms, having left me on the alert. In April, 1874, Dr. Trail came back from the Tapajos, and brought with him various plants, among them one species that he thought

could be the *Bactris campestris* Poep., giving me a handwritten description of the species. Since I didn't agree with him, showing that I had already collected that species in the Caramuru Mountain, regarding it as new, and didn't give the specific name simply because I had not collected it in fruit or flower (what can be confirmed through a report sent by me to the Agriculture Office in 1872), and also showing him the *Genera* ... of Martius and the *Enumeratio* ... of Kunth, he arrived at the conclusion that it was a new species. We then decided to give it the name *elegans*. If I published the description of the species that Dr. Trail gave me, it was only because I wanted to be courteous to him. He had no right to use this species as his new species. ... the exclusion of my name as author of this species is not legal ..." (Barbosa Rodrigues, 1879: 22).

The same criticism was directed by Barbosa Rodrigues to other two species of *Bactris: B. oligocarpa* (Plate X) and *B. syagroides*. In relation to the latter, B. Rodrigues wrote:

"It shows again [Trail's work] one species, *B. syagroides*, which proves that I made a mistake when I spoke frankly with Professor Trail. I had supposed that, since I was writting a monograph, which he was not doing, and since he was giving me a plant ... which I had already drawn in 1872, I was allowed to, as a person who is studying the group, to put together his name with mine ... It is true that Mr. Trail gave me one small leaf and suggested the name *syagroides*, which I accepted because I had not named it specifically ..." (Barbosa Rodrigues, 1879: 26).

In relation to the above species (*oligocarpa* and *syagroides),* Barbosa Rodrigues added indeed Trail's name to his own, thus turning the British into the co-author of the two species. Trail, nevertheless, ignored entirely B. Rodrigues' earlier descriptions and authorship, and assumed for himself the full authorship of the species.

Complaints concerning a few additional species and varieties, for which Trail did also not respect Rodrigues' descriptions and authorship, were equally included in B. Rodrigues' paper *Protesto-Appendice* (Barbosa Rodrigues, 1879).

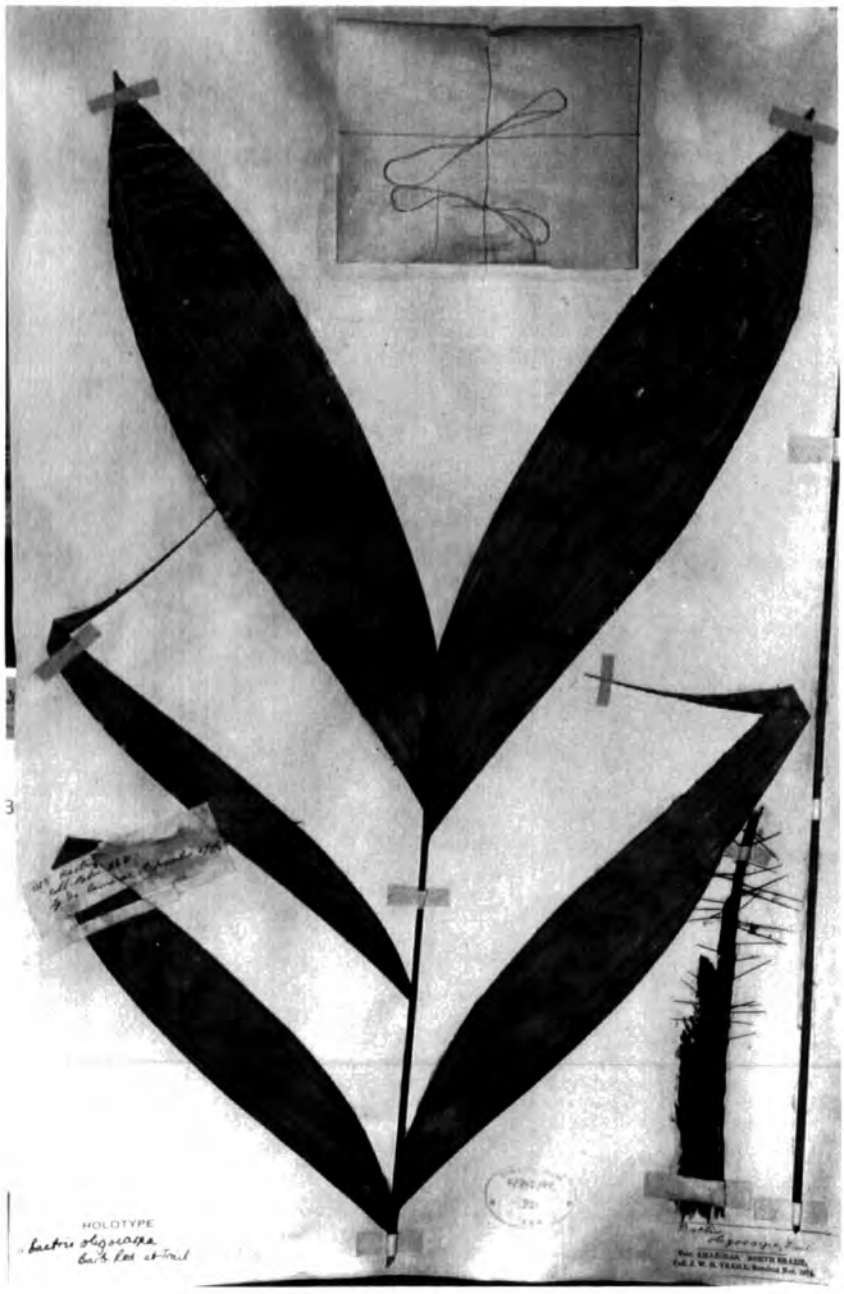


Plate X

Holotype of *Bactris oligocarpa* B. Rodrigues and Trail, deposited at the Herbarium of the Royal Botanic Gardens, Kew. The authorship of this species was one of the main ingredients of the dispute between Trail and Barbosa Rodrigues. Photo by courtesy of the Royal Botanic Gardens, Kew.

If one examines the episode within the context of the epoch, the conduct of both botanists can be more easily understood. Regarding Barbosa Rodrigues, it is clear that he felt his "natural" domains invaded and, even worse, his scientific interests gradually appropriated by one whom he saw as an opportunist. Not surprisingly, he eagerly tried to protect his interests assuming a posture justified by a presumed right of precedence. Since B. Rodrigues had first obtained, and drawn the specimens, he took for granted that such initial steps would alone guarantee him the authorship of his new species. Trail, on his turn, had no idea his actions could be taken for unethical, since he hid no information from B. Rodrigues, having even given him handwritten descriptions and samples of his own specimens. For Trail, the fact that he had been the first to collect complete specimens of the new species (i.e. with leaves, flower and fruit), gave him the notion that he had assured for himself the right of describing them.

It should be emphasized that, behind this apparently foolish discussion on autorship priority for naming new species of palms, lay a rather profound political aspect regarding the national identity of Brazilian naturalists. The local scientific community had been trying, since the 1840's, to impose itself both nationally and internationally. In this respect, disagreement with the privileges traditionally granted by the Brazilian Government to foreign naturalists visiting the country was in order. Frequent were complaints concerning the free access by foreigners to the scientific information accumulated at local institutions which, according to the Brazilians, were used by the visitors exclusively to their own benefit.[2] The Brazilians were also offended by the lack of recognition, by foreign scientists, for the work of the native naturalists.[3] In such context, the dispute between Barbosa Rodrigues and Trail developed.

João Barbosa Rodrigues was a bright and extremely ambitious self-taught man, who had been aspiring to a place among Brazilian botanists since the late 1860's.[4] Although a skilful botanical artist, he had no formal education on botanical matters, and was therefore rejected by some of his colleagues, who maintained that he needed more theory before venturing into systematic work.[5] Nevertheless, B. Rodrigues obtained the patronage of an influential character of the Brazilian Imperial Government, the Baron of Capanema (Guilherme Süch)[6], who had an interest in natural history, being himself an engineer, geologist and amateur botanist. Through Capanema's influence, in 1872 Barbosa Rodrigues was commissioned by the Brazilian Agriculture Office to explore the Amazon region for, among other things, "study the palms and complement the work *Genera Palmarum* of the venerable professor Dr. Martius, correcting eventual errors" (Barbosa Rodrigues, 1879: 7).

For Barbosa Rodrigues, the mission represented a lifetime opportunity to establish his reputation as a recognized scientist. In a country where natural sciences were traditionally studied by foreigners (see Sub-chapter 1.4 and 1.5), and invariably with full support from the local Government, the official backing of an independent Brazilian scientist - Barbosa Rodrigues - for a purely scientific mission represented a great incentive for the development of the study of natural sciences in Brazil. As stressed by Mori and Ferreira (1987: 82): "it is noteworthy that Barbosa Rodrigues was the first of these great "palm explorers" [the others being Martius, Spruce and Wallace] to be a native Brazilian".

5.2. Conclusion

A most relevant aspect for understanding the present polemic regards the scientific mistrust which existed between European scientists and those of colonies and ex-colonies. Due to an ever present suspicion concerning foreign scientists, native naturalists were invariably partial on their judgement, regarding visiting scientists as potential rivals. On the other hand, European scientists always assumed a rather arrogant posture in relation to native scientists, seeing them as poorly trained and unskilled professionals. Such a notion, it seems, was widespread among scientists from the colonizing countries, having Home (1988), MacLeod (1988) and Newland (1991) recorded cases of scientific mistrust which developed between British and Australian scientists during the nineteenth century.

It is now clear that Trail saw in the study of palms a good oportunity to promote himself in Britain and establish a reputation for himself within the European scientific community. In fact, just the chance of spending nearly two years in Amazonia represented in itself a starting point to build up his career on his return to Britain. When in Amazonia, Trail started first to develop an interest in the association between tenant-ants and plants. He also took his time collecting indiscriminately others groups of plants besides Melastomataceae (see Chapter 4). However, after he met Rodrigues and learned from him that much work was needed on the taxonomy of Amazonian palms, he eagerly took the opportunity.

Even though Barbosa Rodrigues had demonstrated competence to the foreigners by showing them his knowledge on the botany of the Amazon region, the Europeans would not recognize him scientifically just for that. Only later Rodrigues understood that the visitors were just interested in making use of his knowledge for their own benefit. When he became aware of that, however, he started to behave childishly, hiding information from the foreigners and publishing his new species as fast as he could. As a result, he was not able to provide careful diagnoses of his new taxa, hence giving grounds to the Europeans for not recognizing his work in full.

Earlier, in a similar fashion but with rather less serious consequences, the study of Amazonian palms also originated a disagreement between the two famous British botanists Alfred Russel Wallace and Richard Spruce. According to Balick (1980), Spruce momentarily lost his interest in palms due to Wallace's declining to co-author a paper describing the palms both had collected in Amazonia. Like Rodrigues, Spruce also had collected the new species ahead of Wallace, having even selected names for them.

As should be expected, Trail got support from Joseph Hooker and the staff at Kew regarding his dispute with Barbosa Rodrigues.

A most notable recognition of Trail's work on palms was the acceptance, by the German botanist Oscar Drude (who was in charge of the elaboration of the works on Palmae included in the *Flora Brasiliensis*), of most of the species described by the British naturalist. Cited in the part "*Observationes de Generum et Specierum Descriptione*" included in Drude's work, is:

"... sed etiam Dr. et W., et Dr. et TRI. in speciebus una cum amicis cl. Hermanno Wendland et Jacobo Trail, elaboratis"

"Itaque sub-species, quas creavit amicus cl. Trail in novis palmis amazonicis descriptis pro earum limitatione magis vel minus valida aut in species aut in varietates mutavimus" (Drude, 1882: 283).

As for Barbosa Rodrigues complaints, a few of his views regarding authorship priority were adopted by Oscar Drude. For two of the polemic species - *Bactris syagroides* B. Rodrigues & Trail, and *Bactris elegans* Trail & B. Rodrigues (Plate XI), Drude considered both botanists as authors of the species, having only inverted the order of the author's names in the latter species. In relation to *Bactris oligocarpa*, however, Drude considered Trail as the sole author, having made the following comment:

" ... Diagnosis a viro cl. B. Rodrigues edita est, quae Trailiana; incertum habemu, utrum haec an illa prioritatem habeat (confer Barb. Rodrigues l.c. Protesto-appendice in ed, II. 1879!" (Drude, 1882).

Plate XI

Holotype of *Bactris elegans* Trail and B. Rodrigues, deposited at the Herbarium of the Royal Botanic Gardens, Kew. The authorship of this species was a major ingredient of the dispute between Trail and Barbosa Rodrigues . Photo by courtesy of the Royal Botanic Gardens, Kew.

Reacting to Drude's work on Palmae, and his choice of adopting Trail's classification of the family, Barbosa Rodrigues wrote an additional protest. In 1882, in a paper titled *Les Palmiers*, Rodrigues blamed Trail once again for not having respected the right of priority. He also blamed Drude for having followed Trail's classification and, therefore, for perpetuating his supposed mistakes.

Trail never commented publicly on Rodrigues' protests, although he was surely aware of the development of the case. Evidence for that is provided by his translation of the above article *(Les Palmiers)* written by the Brazilian botanist. A copy of the handwritten translation by Trail is deposited at the Library Archives of the Royal Botanic Gardens, Kew (Ms Trail, 1882). As for B. Rodrigues, it is my view that the dispute with Trail was to his advantage in establishing his reputation as a botanist. To a still sceptical community of Brazilian scientists (see above), Rodrigues was finally able to confirm the significance of his research work, considering that reputable foreign scientists had attempted to appropriate his scientific findings.

In Brazil, B. Rodrigues blamed the Government for not having provided funds for the publication of a major work on palms, in which his drawings could put an end to all the polemic matters regarding his new species. Only in 1903 B. Rodrigues finally published his *Sertum Palmarum Brasiliensis*, a monograph on Brazilian palms which included descriptions and drawings of his new species. Rodrigues' work was, at the time, much praised by those interested in the study of palms.[7]

As for Trail's and Barbosa Rodrigues' personal contributions to palm taxonomy, a recent revisionary work on Amazonian palms (Henderson, 1995) has established that, of

the 72 new taxa described by Trail and the 99 by B. Rodrigues, about 10% of each ones total are still valid today. In this respect, therefore, their individual contributions should be considered as equally relevant.

Finally I should mention that Barbosa Rodrigues' reached his objective of becoming an internationally renowned scientist. Nationally, he became the foremost Brazilian botanist of his time, and finished his days as Director of the major botanic garden of Brazil - the "Jardim Botânico do Rio de Janeiro".[8]

NOTES

1. Part of the geological, zoological and botanical material collected by Rodrigues was sent to the Museu Nacional in Rio de Janeiro (See documents deposited at the Archives of the Museu Nacional - AAHCMN, Docs. 35, 1874; 31, 33 and 34, 1976).

2. For additional details, see Capanema (1854).

3. The Brazilian botanist Francisco Freire Alemão was one of the first to protest against the lack of recognition by foreign scientists, whom he blamed for never considering the scientific descriptions of new species published by Brazilians (Neiva, 1929: 26).

4. In 1869, while working for 6 months in a stud farm at the Province of Minas Gerais, B Rodrigues started his studies on orchids, having produced at the time his first work on the group (Ladislau Netto, manuscript deposited at the Archives of the Imperial Museum, Petrópolis - Ms 25, Doc. 913). See also B. Rodrigues (1877).

5. Ladislau Netto commented on his encounter with B. Rodrigues, during which the latter asked his opinion about his work on orchids. Ladislau replied that, it was necessary to know technically a plant in order to draw it. He also told Rodrigues that he should first learn the basics before moving to such enjoyable task (Ms 25, Doc. 913, deposited at the Archives of the Imperial Museum, Petrópolis).

6. Son of Roque Schüch, an Austrian who travelled to Brazil as librarian and keeper of the natural history cabinet of Princess Leopoldina of Habsburg, the first Brazilian Empress (Blake, 1898).

7. For updated information on the taxonomy of the Brazilian palms see Henderson (1995).

8. For more details on B. Rodrigues' life and work see: Ihering (1911), Hoehne (1941), and Salgado (1945).

CHAPTER 6. CONCLUSION

Besides disclosing overlooked information on the natural history of Amazonia, the present work also constitutes a case study for documenting the concept of "cultural imperialism" in the nineteenth-century. Regarding the history of science of Brazil, this is the first attempt to approach the above theme by analyzing the objectives and outcome of a foreign exploratory expedition through the perspective of the political and socio-economic context of the time.

The analysis of Trail's (foreign) scientific expedition to the peripheral centre represented by Brazil, confirms the intrinsic relationships between science and imperialism advanced by earlier authors. Trail's travels and work in Amazonia are of particular interest to discussions on this subject, in the sense that he served simultaneously three distinct interests: those exclusively commercial of the expedition's financing body (i.e. the Amazon Steam Navigation Co.); the ones intrinsic to the imperialistic metropolis (well typified by Kew's eager search for the rubber seeds); and those associated with Trail's professional ambitions. The relationships between science and imperialism are particularly evident in Trail's performance as Kew's informal agent in the search for rubber seeds, an assignment linked to the objective of conquering for Britain the world market of natural rubber.

The notion of "scientific colonialism" is implied in Trail's disrespect for the Brazilian botanist Barbosa Rodrigues, an aspect that confirms the disregard of scientists from developed centres in relation to those of colonies or ex-colonies, as shown earlier

by MacLeod (1988), Newland (1991) and others. The dispute between Trail and the Brazilian botanist Barbosa Rodrigues developed as a consequence of such preconception.

Due to the distinct sources of interest associated with Trail's voyage to Brazil, attempts have failed to fit his case into the models developed by Basalla, Pyenson and others for illustrating the generation and diffusion of scientific knowledge. The difficulties encountered seems to confirm the problems associated with the utilization of such models, which are characteristically developed from generalizations which disregard specific, regional circumstances and episodes. As noted earlier by Knight (1987b):

> "When contributors try to apply such a model [Basalla's], they find how hard it is to do. The idea is so very general that it seems almost analytically true; and yet there are so many differences between ... [different countries] that the model is unhelpful. It lacks any of the testability which one looks for in a scientific theory"

Trail was one of several naturalists from Europe and the U.S. to visit the Brazilian Amazon region during the nineteenth century. None, however, had so much logistic support as Trail, except perhaps for the Swiss-American Louis Agassiz, who received extensive support from the Brazilian Government due to his worldwide reputations as a man of science.

The creation fo the Amazon Steam Navigation Company, and the privileges it obtained for functioning in a traditionally closed region to foreign enterprises, is in itself an evidence of the strong economic ties between Britain and Brazil which prevailed at the time of Trail's trip to Amazonia. Even though the Americans had already established an aggressive political strategy for the commercial opening of the Brazilian portion of Amazonia, it was the British who were chosen for that purpose because of a tradition of commercial alliance established much earlier with Portugal and followed later by Brazil.

Examining the historical context of the epoch of Trail's visit to Amazonia, it became clear that the Amazon Steam Navigation Company was much more influential throughout the Brazilian Amazon region than previously suspected. I feel that, more than just a mere private enterprise in nineteenth-century Amazonia, the Company was instead a major participant in the two main moments of political transformation which occurred in the region. First, when it was formed in 1852 as a genuine Brazilian enterprise ("Companhia de Navegação do Amazonas"), it emerged as the main component of an official political and economical project visuallized to assure Brazilian sovereignty over the region. Later, after being sold to British entrepreneurs in 1872, the Company became a symbol of the definitive rupture with old official nationalistic policies which had been followed in the region for centuries. The 1873-75 expedition of the Amazon Steam Navigation Company marks precisely the consolidation of the new era of political liberalism which took place in Brazilian Amazonia. The members of the expedition, in their turn, became the first foreign to witness such a radical shift in the political history of the region.

The initial phase of the process of the political changes in Brazilian Amazonia coincided with the presence in the region of three British naturalists: Henry Bates (1848 - 1859), Alfred Wallace (1848 - 1853) and Richard Spruce (1849 - 1855). All of them took some advantage of the practical consequences of the innovations already tangible at the time: Spruce's voyage to Peru in 1855 was made on board a steamship of the newly formed "Companhia de Navegação do Amazonas"; and the return voyage of Wallace and Bates to Belém was also made on board a boat belonging to the Brazilian company. Twenty years later, during the phase of introduction of liberal policies, the British were still on the scene. This time, however, not as mere spectators, but rather as foreground

participants due to the acquisition of the Brazilian navigation company and the launching of the first exploratory expedition to enter Amazonia with commercial purposes.

Brown and Lidstone's (1878) narrative of the 1873-75 expedition of the Amazon Steam Navigation Co. is the only published record of Trail's travels and work in Amazonia. The book, however, is much more an account of the trivial occurrences of the voyage than anything else, with the authors failing to recognize (and hence record) the scientifically relevant features of the region. Such a cosmetic approach actually earned the book severe criticism from the American naturalist Herbert Smith (1879), who considered it an "... account almost worthless ... devoid of information...".

The foremost significance of Trail's unpublished travel diary is precisely its merit of containing relevant and interpretable information on the outcome of the expedition. The scientifically oriented accounts included in it, appart from other ingredients, represent a valuable testimony of the characteristic features of the original vegetation of Amazonia, particularly that of the tributaries of the upper Amazon. For the singular information contained in Trail's diary, particularly regarding botany, I feel that it should be regarded as scientifically and historically important like those produced by the more renowned naturalists who visited Amazonia during the nineteenth century. Moreover, I anticipate that Trail's accounts, because of its essentially descriptive approach, will become more useful as the anthropogenic degradation of Amazonia progresses and the few existing records of the original conditions become fundamental for comparative studies.

The interpretation of the observations of social matters included in Trail's travel diary took into consideration the short time spent at each stop, and the consequent superficial investigations that such adverse circumstances permitted. He was capable, nevertheless, capable of remarkably correct interpretations of whatever he observed. Contrary to other naturalists who visited Amazonia, Trail never saw the region as a "tropical paradise" which "British, German or French" colonization could transform into a "developed centre". He was one of the few naturalists who perceived the exact dimension of the various problems facing those who intended to exploit a region with such natural diversity and territorial extension. He also correctly opposed the devastating extractive practices disseminated throughout the region, having recommended instead the cultivation of native products as the proper way to preserve the land and develop settlements. In addition, he correctly condemned the inconsequent proclamation of a supposedly readly accesible wealth hidden in Amazonian lands. For instance, the exploitation of natural products in certain unfavourable conditions or difficult areas would invariably result in loss rather than profit. So, even though Trail was only 23 years old when he travelled in Amazonia, he had already developed a remarkably realistic notion of the problems associated with the exploration of the natural resources of the Amazon region.

Above all matters, Trail's prime interest was always natural history subjects. Having left his home Scotland with his career delineated - i.e. a physician to be and potential amateur entomologist (a practice not unusual in nineteenth-century Britain) -, the trip was seen as an unique opportunity to change his professional future by fulfiling his ambitions of becoming a full-time natural scientist. His move to a botanical career,

therefore, happened as a consequence of the opportunity he envisioned and took maximun advantage of.

Trail was only eight years old when Darwin's work "*On the origin of species* ..." was published in 1859. Darwin's revolutionary ideas, therefore, could not have any impact on the young Orkney-boy at the time. Later in life, however, Trail became well acquainted with the new scientific theories of his time, having showed particular interest on questions related to natural classifications (Appendix III, letter n0. 16) and heredity. Concerning the latter subject, Trail recorded on his memories: "My interest in questions of heredity had been growing from the side of the scientific problems, and I had followed Galton's application of it to questions of human inheritance ..." (*Memorial Volume*, 1923:4).

Prance (1971: 61) has referred to Trail's botanical collection as "fairly small". He failed to consider, however, that the Scotish naturalist travelled in the Amazon as an employee of a commercial company, having thus devoted most of his time carrying out the survey work he was in charge of. If one considers the relatively short periods of time Trail actually spent searching for specimens, his collection should be regarded as a notable accomplishment. This is particularly true if one compares his collection with those obtained by other naturalists who collected in the region, namely Karl Martius in 1819-20, Ludwig Riedel in 1828-29, Eduard Poeppig in 1831-32, Gustav Wallis in 1863-64, and João Barbosa Rodrigues in 1871-74 and 1883-89 (see Urban, 1906). Among British naturalists in particular, Trail's accomplishment also deserves notice. Wallace lost his collection at sea, having preserved only his notes and sketches of palm trees and fishes. As George (1979: 504) points out: "in terms of finance and the acquisition of an important natural history collection, the four and half years were a failure". Bates, who is justly

considered the most productive entomological collector of Amazonia of all times, obtained no significant botanical material. Even though Dickenson (1992: 215) has recently called the attention to the variety of natural products such as "palms, fruits, woods, medicines, balsam, fibres and resins" despatched by Bates to his auctioneer in London, there is no indication that this material contributed to the botanical knowledge of the region. As for the botanist Spruce, praised as the most notable plant collector ever to work in Amazonia, his collection of about 1,100 species gathered during the first 18 months spent in the lower Amazon and tributaries (Wallace *in* Spruce, 1908: 205) matches that obtained by Trail at about the same amount of time. The botanist William Burchell, in turn, also collected a quantity similar to Trail during the nearly 15 months spent in the eastern Amazon region (Urban, *ibid.*: 10; Prance, *ibid.*: 30).

Trail's collection of vascular plants includes more than 1,100 species, and was put together in only 17 months. It comprises a significative sample of the botanical diversity of the Amazon region, with about 108 families represented. If added to the nearly 800 species of Algae, Fungi, and Lichens collected, the whole botanical collection amounts to more than 1,800 species.

Due to the restrictions imposed on him by his surveying work, Trail had to limit his collecting activities to a maximum distance of ½ to 1½ mile from the river banks. As a result, the great majority of his specimens came from areas which were seasonally flooded. Such forest type includes Prance's (1980) both "seasonal varzea" (i.e. white water forest flooded by regular annual cycles of rivers) and "seasonal igapó" (i.e. black and clear water forest flooded by regular annual cycles of rivers). Botanical material was also obtained in "savannas" and "campos" such as those at Monte Alegre, Rio

Trombetas, Rio Tapajós, and Rio Negro. Just a small portion of Trail's collection was obtained in dry land forests (i.e. non-flooded ground).

Trail's accurate descriptions of the marginal vegetation of the tributaries of the Amazon River demonstrate his talent for botanical field work. Wallace's endorsement of Trail's accounts on the symbiotic association between ants and Melastomataceae species confirms his skill for scientific observation.

There is evidence to suggest that Trail's interest in the study of palms was inspired by the Brazilian botanist J. Barbosa Rodrigues. It is also true that it was Rodrigues who introduced Trail to the field identification and selective collecting of palms. Trail took good advantage of this practical introduction, and went on to collect on the richest palm grounds of the Amazon region, which are those situated in the upper reaches of the river. The copious palm material obtained by Trail, and the resulting taxonomic work containing descriptions of several new species and varieties, consolidated his status as a professional botanist. The prompt nomination to a post of botanist abroad after his return home, and an invitation shortly after for a post at home, confirms his recognition as a botanist by the British scientific community. Trail's expertise on palm taxonomy, by the way, was acknowledged by Hooker himself, who consulted him for a natural arrangement of the palm genera for his "*Genera Plantarum*" (Bentham and Hooker, 1862-83) (see Appendix III, letter n0. 16).

The zoological collection obtained by Trail in Amazonia reflects essentialy his preference for certain groups. His fondness of insects is clearly discernible by the expressive number of species collected and the care dedicated to the specimens. Also of interest to Trail was the Arachnida, with other invertebrate groups much less collected. To my knowledge, with the exception of the insect and spider material, all of

Trail's miscellaneous invertebrate material is now lost. Among the vertebrates, the most significant collection was that of fish. According to Trail's travel diary, his ichthyological material included several new species. Of Trail's fish collection, however, only a box of a few dried specimens has survived. As far as I know, the other vertebrates collected have also been lost.

Commenting on the significance of collections to nineteenth-century museums, Sheets-Pyenson (1986: 289) stressed that "... quantity without quality was meaningless: in the absence of type specimens ... massive amounts of local materials had little impact at an international level". Certainly, it was the search for new forms that motivated collectors to travel to distant places around the world, and Trail was no exception to that. The numerous new species obtained in Amazonia were decisive for establishing Trail's reputation in his home Britain.

Trail's Amazonian collection was, for the most part, generously distributed among specialists, most of whom took advantage of the scientific novelties included in it. As a consequence, eminent botanists and zoologists of the time, from Great Britain and abroad, payed tribute to Trail by naming new species and genera after him. Of the more than 100 new botanical species and varieties, and the nearly 500 new arthropoda Trail collected, no less than 30 species and 4 genera received his name. Scientists who payed tribute to Trail include, among others, the distinguished German botanist Oscar Drude (who described the species *Carludovica trailiana* on his study of the family Cyclanthaceae included in the classical work *Flora Brasiliensis*); the illustrious Belgian botanist Alfred Cogniaux; the eminent British botanist George Bentham; and the British zoologists Frederick Pickard-Cambridge and David Sharp.

Trail's observations and collections from Amazonia did not produce new scientific theories , as was the case of those by Bates and Wallace. He contributed, nevertheless, to the knowledge of the natural history of the region especially through his published works on palm taxonomy and his contribution to the monumental work "Flora Brasiliensis". Besides such direct contributions, Trail also contributed indirectly to amazonian natural history by generating taxonomic information through the study of his collections, both by himself or other taxonomists. In this sense, Trail's collections played a relevant role in revealing the enormous biodiversity of the region.

In regard to the scientific development of Brazilian amazonia, all foreign naturalists who visited the region (Trail included) contributed very little to the process, since the material collected was invariably fowarded to the explorer's country of origin and all relevant information on the exploitable natural resources of the region were not made avaiable to the locals. In the case of Trail's financing body, however, it's understandable that the strategic information produced by the expedition was not disclosed, considering the commercial nature of the enterprise. Not surprisingly, though, only a single report by the members of the expedition ever came to light, which actually happened because of the important geographical information contained in it. This report, which included the first description of the Rio Jutaí (a tributary of the upper Amazon), was considered relevant to Brazilian science and therefore published by the Sociedade de Geografia do Rio de Janeiro.

Finally, I should mention that the Amazon region has been the focus of much interest in recent years due to the recognition of the great scientific importance of its socio-and biodiversity, and the economic potential of its natural resources. As a result, there is nowadays a great demand for basic information on the botany, zoology and

indigenous populations of the region. The scientific legacy of the early explorers and naturalists, consequently, are gaining increased importance as tools for comparative studies between the region's original and present environmental and social conditions. In this respect, this work should be regarded as a contribution to the process of collecting and accumulating historical information on the natural history of the Brazilian Amazon region. Complementarily, it also contributes overlooked information on the social and political history of the region.

MANUSCRIPT SOURCES

a) Archives of the Aberdeen University Library. Trail's journal of his voyage to the Amazon region and related documents.

- Ms 851 (19 September 1873 to 21 February 1874). Journal describing voyage to Pará and travels in Amazonia; comments upon local topography and both flora and fauna.

- Ms 852 (21 February 1874 to 13 October 1874). Journal as above given details of specimens taken.

- Ms 853 (13 October 1873 to 28 March 1875). Journal as above. Appendix on skin diseases suffered during the expedition; Ms of the paper read at the Aberdeen Medical Association in 1875; list of vascular plants collected in Amazonia and sent to Kew.

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Appendix I. Documentation pertaining to the sell out of the Companhia de Navegaçao do Amazonas to British entrepreneurs. The documents are deposited at the Public Record Office, London (File on Amazon Steam Navigation Company, Ltd., BT 31/14438/6328.

Memorandum of Agreement, made this 3rd day of May, 1872, between the Companhia de Navegação e Commercio do Amazonas, an anonymous Society established and incorporated at Rio de Janeiro according to the laws of the Empire of Brazil (hereinafter called the old Company), of the one part, and the Amazon Steam Navigation Company Limited (hereinafter called the new company), of the other part.

Whereas a Contract dated the 10th October, 1857, renewing and modifying a previous similar Contract, was entered into by and between the Imperial Govemment of Brazil of the one part, and the old Company of the other part, whereby the old Company undertook to carry on a system of steam navigation on the River Amazon and its tributaries, upon the terms and conditions therein mentioned, and the said Govemment granted to the old Company during the continuance of the said Contract the rights and privileges therein more particularly set forth, which Contract was subsequently modified by Imperial Decrees of the 20th February, 1858, 9th May, 1860, and 7th June, 1871, copies and Decrees are hereunto annexed:

And whereas several Contracts, dated respectively the 12th April, 1862, 22nd January, 1864, 16th January, 1867, 23rd April, 1870, 13th September, 1870, and 5th December, 1871, were entered into by and between the Provincial Govemment of Pará, in the said Empire, of the one part, and the old Company of the other part, whereby the old Company undertook to make other voyages with steam ships between Belem, the capital of the Province of Pará, and certain other places, and certain subsidies were in consequence thereof granted to the old Company, copies of which Contracts are also hereunto annexed:

And whereas the old Company is possessed of the steamships mentioned in the schedule hereto, and of certain lands, boats, quays, landing places, a dry dock, wharfs, warehouses, depots, stores, machinery, plant, and other property in the Empire of Brazil, in full property in perpetuity, free from all incumbrances, and the old Company has, down to the date of these presents, carried on a system of steam navigation on the River Amazon and its tributaries, in accordance with the terms and conditions of the sais Contracts and Decrees:

And whereas the new Company has agreed with his Excellency the Baron de Mauá (the President of the old Company) on behalf of the old Company, under an authority granted to him for that purpose, to purchase from the old Company all the property hereinafter enumerated at and for the price of £650,000 sterling, and upon the terms and subject to the conditions hereinafter contained:

Now these presents witness that it is agreed by and between the parties hereto as follows:

Article 1. The old Company will sell and the new Company will buy for the sum of £650,000 sterling, (subject to the deduction mentioned in Article 11), the Contracts, lands, steamships, and other property (other than money, securities for money and debts) of the old Company.

Article 2. The property belonging to the old Company agreed in the preceding Article to be sold shall comprise:

A) The said Contract with the Imperial Government of Brazil, and the said Imperial Decrees, dated respectively 20th February, 1858, 9th May, 1860, and 7th June, 1871, and all rights, privileges, benefits, and advantages thereby respectively granted;

B) The said Contracts with the Provincial Government of Pará, and all other contracts (if any) between the Government ane the old Company, and all rights,
privileges, benefits and advantages thereby granted;

C) All the lands of the old Company situate on or near River Amazon and its tributaries, comprising in all 990,340 English acres, or thereabouts, and all other, if any, lands in Brazil belonging to the Company, together with the rights and appurtenances belonging to all the said lands respectively;

D) All the said steamers, with the outfit and appurtenances, and the quays, landing-places, dry dock, wharfs, warehouses, floating stores, lighters, coal depôts, boats, offices, buildings, machinery plant, and other property of the old Company used for, or in connection with, the Concession and the navigation of the Amazon and its tributaries;

E) All other property and effects of the old Company, except money and securities for money and debts owing to the old Company which shall accrue at any time before the 1st July, 1872.

Article 4. The said sum of £650,000 shall be paid to the Baron de Maua, on behalf of the old Company, in London, in manner following, that is to say: £ 162,500 immediately upon allotment of the shares of the new Company;
£ 162,500 on the 15th June, 1872;
£ 162,500 on the 15th July, 1872; and the remaining
£ 162,500 (subject to the deduction mentioned in Article 11) on the 15th August, 1872.

The capital of the Company is £ 1.000.000 divided into 50.000 shares of £20 each.

Director shall consist the holder of at least 50 shares.

Founders of the Amazon Steam Navigation Company, Ltd.,

Ireneo Evangelista de Souza (banker)	50 shares
Colonel Sir Frederick Leopold Arthur	50 shares
Captain Sherard Osborn R.N., C.B.	50 shares
Standish Prendergast, Viscount Gort	50 shares
Bartlett James (Merchant, Director of Rio Gas Co.)	50 shares
Howard Lewis (Merchant)	50 shares

1911 - Registrated as Amazon River Steam Navigation Company.

1924 - Voluntary Liquidation.

Obs. Manoel Antonio Pimenta Bueno (Manager of the Company in Para held in 1862 25 shares.

Decree No. 4735 7th June, 1871

The Imperial Princess Regent, in name of His Majesty the Emperor D.Pedro the second, considering the representations of the Company of Navigation and Commerce of the Amazon, duly represented...
Orders to be conceded to it authorisation to transfer to a foreign Company the rights and obligations of the Contract approved by the Decree nos 2.107 and 2.591 of 20th February, 1858 and 9th May, 1860 under the clauses hereunder given signed by Theodoro Machado Freire Pereira da Silva...

Renewal of the Contract which the Imperial Government, in virtue of the authorisation conceded by Decree No. 934, of the 29th of August 1857, makes with the Company of Navigation and Commerce of the Amazon, of which the Baron de Maua is President.

1st. First line Para and terminate at Manaos

2nd. The second line shall be from Manaos to St. Paulo and with a contract with the Peruvian Government goes as far as Nauta in the Republic of Peru.

4th. The Imperial Government shall pay montly to the Company for the service of the three lines the amount of 35 contos of reis.
The second line the Company shall receive subsidy which the Government of Peru shall give whilst the contract last.

8th. The packets of the Company shall be naturalized Brazilian being exempt from any imposts for transfer of proprietorship of registration. With regard to their crews the same rules shall be observed as ar practised with those of the national vessels of war.

18th. There are conceded to the Company the shore lands which shall be unoccupied, in front of the lands or domains which the said Company possesses in the city of Belem, or any closely inhabited places, or other localities of the higher or lower Amazon at which the packets shall call, in order to erect on them the bridges, sheds and edificies which it shall think necessary for the shelter of the passengers, arrangement, shipment and unloading of the merchandise it shall carry; the extent of such lands being regulated by the Government.
There is also concede to the Company on the beach called Porto de Sal in Para, or in any other suitable locality in the ports of Para or of Cameta, the shore land necessary for the construction of a ship on which the packets may have their bottoms cleaned, and repaired; as well as land of twelve fathoms frontage and thirty deep, in Tabatinga, for the construction of a shed with an embarcation bridge in front.

19th. The Company shall have power to cut the timber necessary for fuel for the steamers in the lands unoccupied within a radius of two miles from the places of call.

21st. The Company, being exonerated from the obligations of the previous contracts, shall preserve its full rights upon the lands which were conceded to it by the Orders of the 6th/X/854, 12/XI/1855 and 3,19/I/856.

TERRITORIES	SQUARE LEAGUES	DATES OF THE CONCESSIONS	SITUATIONS
1	4	6/X/1854	On the banks of the Rio Negro between the creek below Lajes and the city of Manaus, Amazon Province
3	12	12/XI/1855	1, in Ilha das Araras (Rio Madeira); 1, right bank of Solimões;1/2 in the suburbs of Serpa; ½ at 15 miles from the city of Belém
13	52	23/X/1855 03/I/1856	2, in Javari; 2, in the Purus; 2, in the Madeira; 1, in Maués; 1, in Carazarancã [sic]; 1,in Vila Bela de Parintins;3, at the choice of the Company in Rio Negro.
5	20	23/X/1855 03/I/1856	1, in Monte alegre; 1, in the Prainha; 1, in Vila Pobre [sic]; 1, in Itaqui; 1, in Papajiz[sic], Pará.
1	4	19/I/1856	In The Rio Trombetas

Steamers belonging to the Company

The Array; The Obidos; The Belém; The Manaos; The Ycamiaba; The Soure; The Inca; The Brazileira; The Tapajoz; The Diamante.

One Iron and two wooden lighters.

Appendix II. List of the vascular plants collected by Trail in the Amazon region in 1873-75. The specimens are deposited at the Herbarium of the Royal Botanic Gardens, Kew. Misspellings of locality names were amended; vernacular names, when given, are quoted.

Dilleniaceae
1. *Doliocarpus* sp. Urubu cachoeira [sic], Rio Juruá, 06.XI.874- shrubby tree
2. *Curatella americana* L.

Anonaceae
3. *Guattarea* sp. 1 (Pará, 04.III.875 - small tree, 12-15 ft high).
4. *Guattarea* sp. 2 (Rio Juruá, 07.XI.874 - tree 80-100 ft. high, 1-2 ft. in diameter).
5. *Guattarea* sp. 3 (Rio Juruá, 07.XI.874 - tall forest tree).
6. *Duguetra* sp. (Barreiras de Janico [sic], Rio Juruá, 12.XI.874 - tree 20 ft. high, fruit like pineaple, size of a large orange).
7. *Trigyncia* sp. (Prainha, in forest, 29.XI.873 - large tree; flowers white).
8. *Xylopria barbata* M. (Santarém, on campos, 21.XII.873 - low tree; flowers white).
9. *X. grandiflora* St.H.
10. Gen. ?

Menispermaceae
11. *Somphoxylon wullschlagelii* E. (Rio Juruá, in forest, 07.XI.874 - a cipó, slender steam bearing flowers, leafless).
12. *Cissampelos fasciculata* B.
13. *C. ovalifolia* D. = *C. amazonica* M. (on campos, near Santarém, 03.I.874).
14. *Sciadotaenia* sp. (near Manaus, 13.VIII.874).

Nymphaeaceae
15. *Cabomba aquatica* A. (Povoado, Rio Uruara, 11.XII.873).

Capparidaceae
16. *Cleome aculeata* L. (Prainha, on beach, 08.XII.873).
16a. *C. pungens* U. (Manaus, on beach, 25.XII.874).
17. *C. guyanensis* A. = *Physostemon intermedium* M. (Santarém, beach, 2.I.874; Lago Caipurú, Rio Trombetas, 02.III.874; Manaus, on beach, 25.XII.874).

Violaceae
18. *Sonidium oppositifolium* R.& S. (Nicolau, Rio Jauari, 21.II.873 flowers white).
19. *Alsodeia macrocarpa* M. (near Manaus, 12.VIII.874; Uara, 22.III.874. - low shrubby tree).
20. *A. falcata* M. (Barreiras de Maniuva [sic], 29.IX.874; Tabocal, 10.X.874 - shrub)
21. *Alsodeia* sp. (Tonantins, 23.XI.874 - tree 20-40 ft., flowers yellowish).
22. *Alsodeia* sp. (Sepatini, Rio Purús, in varzea, 30.IX.874 - low tree, petals yellowish-white).
23. *Alsodeia* sp. (Rio Jutaí, 5^0 12'S, 29.I.875).
24. *Leonia racemosa* M. (Cuiabá, Rio Purús, in varzea, 13.IX.874 - small tree, flowers greenish, rising form steam).
25. *Sauvagesia sprengelii* St.H. (marshy campo, north of Prainha, 18.XI.873
26. *S. erecta* L. Marsh near Rio Jauari, 24.XI.873; marsh campo at Xibaru, Rio Negro; damp place on Barreiras de Mani[...illegible], Rio Purus, 28.VIII.874).

Bixaceae
27. *Mayna paludosa* B. Coari, (Rio Solimões, 16.X.874 - tree 20-30 ft. high, flowers white).
28. *Ryania* sp. (Rio Jauari, in thicket, 24.XI.873 - tall shrub, flowers white).

Polygaleae
29. *Polygala angustifolia* H. (Campo de Almeirim, 19.II.875).
30. *P. timoutou* A. (marsh beside Rio Jauari, 24.XI.873).
31. *P. variabilis* H. (campo near Lago Achipura [sic], Rio Trombetas, 05.III.874).
32. *P. adenophora* DC. (campo above Escovado [sic], Rio Tapajós, 19.III.874 - low wiry herb).
33. *Polygala* sp. (marsh near cliff, Rio Jauari, 24.XI.873 - wiry herb, flowers red).
34. *Securidaea pubescens* DC. (bank of the Rio Parauaquara [sic], 5.XII.873 - flowers pink).

35. *Securidaea* sp. (bank of the Rio Jauari, 22.XI.873 - climber, flowers red).

Vochysiaceae
36. *Qualea grandiflora* M. (campo at Prainha, 29.XI.973).
36a. *Trigonia spruceana* B. (Cachoeira de Tapuruquara, Rio Negro, 25.VI.874).

Caryophyllaceae
37. *Drymaria cordata* W. (plantation near mouth of the Rio Cuiuni, 15.VI.874 - "acorao", herb like chickweed).

Hypericineae
38. *Vismia dealbata* H.B.K.
39. *V. macrophyla* H.B.K. (Tonantins, in forest, 24.XI.874 - shruby tree, 20 ft. high).
40. *Vismia* sp. (Barreira de Cupana [sic], Rio Purus, 04.X.874 - shrubby tree).

Ternstroemiaceae
41. *Ternstroemia carnosa* C. (Taruma, near Manaus,in igapó, 31.VII.874 - flowers white).
42. *Ternstroemia* sp. (beach at Marapata, Rio Negro, 25.XII.874 - shrub).
43. Gen. ?

Guttiferae
44. *Tovomita pyrifolia* Pl. & Ch. (beach at Marapata, Rio Negro, 25. XII. 874).
45. *T. ? amazonica* P. (Juruapuca [sic], Rio Juruá, 28.X,874 - shrub tree, flowers white).
46. *Rheedia* sp. (Tonantins, on edge of forest, 23.XI. 874 - tree 30-40 ft. high, petals white).

Malvaceae
47. *Sida* sp.
48. *S.* rhombifolia
49. *Wissadula spicata* P. (Abacaxis, 13.V.874).
50. *Urena lobata* L. (beach at Prainha, 17.XI.873).
51. *Pavonia cancellata* C. (sandy beach at Prainha, 08.XII.873; Manaus, 13.VI.874).
52. *Hibiscus furcellatus* D. (Nicolau, near Rio Jauari, 21.XI.873 - flowers pink, probably cultivated).
53. *H. rosa-sinensis* L. (cultivated at Barreiras de Monte Alegre [sic], 28.XII.873).

Sterculiaceae
54. *Myrodia* sp. 1 "Naja rana" (Rio Jutai, at 5^0 12 S', 29.I.875 - fruit has large calix from which a fluid very attractive to ants exudes).
55. *Myrodia* sp. 2 "Naja rana" (Rio Juruá, in forest, 07.XI.874 - tree 12- 20 ft. high, used as a remedio [medicine] for fevers).
56. *Helicteres pentandra* L. (Vila Bela de Parintins, 06 & 15.IV.874 - small tree, flowers red).
57. *Melochia hiranta* C. "Marvo" (Nicolau, beside Rio Jauari, 02.XI.873 - flowers pink).
58. *Theobroma cacao* L. (igapó at Ananas, Rio Solimões, 06.IX.874 - flowers white).
59. *T. ferruginea* B. "Cupua-i" (Parauari, 20.X.874 - small shrubby, tree flowers purple.
60. *T. bicolor* H. & B. ("cacau do mato" lago near Manaus, 05.VIII.874; "Cupua-i" Gaviao [sic], Rio Juruá, 10.XI.974; "cacau bravo" Rio Sapó, 21.XI.874 - flowers purple).
61. *T. obovata* K. "Urubu-acaim" (Parauari, 20.X.874 - low tree, petals purple).
62. *T. ? glauca* K. "Macaçacaim" (Barreira Branca [sic], Rio Jutai, 31.I.875 - tree 15-25 ft. high, branches in whorl of 3, each bifid).
63. *Theobroma* sp.
63a. *Theobroma* sp. "Cupu bravo" (Rio Juruá, in forest, 07.XI.874 - tree 30- 40 ft., fruit globular).
64. *Herrania* sp. (Sobral, Rio Purus, in varzea, 17.IX.874 - small tree, petals brown, very long).
65. *Herrania* sp. "Cacau de Andira" or "jacaré [illegible] (Lago cerrado, Rio Juruá, 30.X.874 - small unbranched tree, 20 ft. high, trunk 2"-3" at base, petals very long [...illegible]
66. *Buettneria rhammifolia* B. L. (Monte Alegre, in thicket near Rio Gurupatuba, 14.XI.873).
67. *B. divaricata* B. (Obidos, in forest, 25.I.874 - low tree).
68. *B. discolor* B. (Obidos, in forest, 26.I.874).

Tiliaceae
69. *Triumfetta althaeoides* L. (Sao Paulo, 26.X.874 - shrub 4 to 6 ft. high, flowers yellow).
69a. *Corchorus argutus* H.B.K. (Nicolau, near Rio Jauari, 21.XI.873).
70. *Mollia speciosa* M. (Cachoeira Grande, near Manaus, 27.XII.874 - tree 20-30 ft. high, petals white, filaments long [... illegible].
71. *Apeiba tibourbou* A. (Serpa, 14.II.875; Sao Paulo, 26.X.874).
72. *Sloanea* sp. "Acuti-resa" (Jurucua [sic], Rio Purús, 25.IX.874).
73. *Sloanea* ? (Camana [sic], Rio Javari, 04.XII.874 - "bulliferous").

74. *Hassettia* sp. (Tauaria, in varzea, 16.IX.874 - low shrub, petals white).
75. *Vasivaea alchorneoides* B. (near Santarém, in the bush, on campo, 24.XII.873).

Linaceae
76. *Erythroxylon amplum*, var. *latifolium* B. (Coari, 16.X.874 - tree about 30 ft).
77-8. *E. coca* L. var. (Parauari, 20.X.874).
79. *Erythroxylon* sp. = 2417 Spruce.

Huminaceae
80. *Saccoglottis* (*Humirium*) *guianense* B.
81. *S.* (*Humirium*) *macrophyllum* B. (Igarapé da Colonia, Lajes, 21.VII.874 - flowers yellowish, leaves bear galls).

Malpighiaceae
82. *Byrsonima crassifolia*, Kth.? var. (Prainha, in capoeira, 08.XII.873).
83. *B. crassifolia* Kth. (campo at Monte Alegre, 10.XI.873).
83a. *B. peruviana* Juss.? (low forest near Belém, 04.III.875).
84. *B. spicata* Rich.
85. *B. ?spicata* (Obidos, 26.I.874).
86. *Burdachia prismatocarpa* Mart. (Igapó at Tarumá, 31.VII.874 - flowers pink, leaves bear galls).
87. *Burdachia* sp.n. (igapó at Lajes, 04.VIII.874 - flowers pink).
88. *Lophanthera kunthiana* (forest at Pariti, Rio Purus, 05.X.874 - small tree, petals yellow with dark mid strips).
89. *Heteropsis helicina* Griseb (below Caburi, Rio Negro, 02.VII.874).
90. *Heteropsis* sp.
91. *Heteropsis* sp.
92. *Stigmaphyllum cardiophyllum* Juss. (Serpa, 14.II.875; climber, petals yellow, anthers greenish).
93. *Stigmaphyllum* sp. (Pariti [sic], Rio Purús, 05.X.874 - prostate, petals & stamens yellow).
94. *Banisteria* sp. (campo at Humaita, Rio Madeira, 20.V.874)
95. *B. spruceana* (Manaus, 13.VIII.874 - among shrubs, flowers yellow).
96. *Tetrapteris benthamiana* Griseb (Barreira de Monte Alegre, 29.XII.873 - low tree).
97. *Hiraea* (*Muscajnia*?)

Geraniaceae
98. *Oxalis* ? *sepium* St. Hil. (beach at Lajes, mouth of Rio Negro, 06.I.875).

Rutaceae
99. *Monimiera trifolia* L. (beach at Prainha, 08.XI.873).
100. *Xanthoxylon* sp. (Tonantins, 23.XI.874 - tree 30-40 ft.).
100a. *Esembeckia* sp. (Monte Alegre, 29.X.873 - tree, leaves bear galls).

Simarubeae
101. *Simaba guyanensis* Aubl. (Monte Alegre, on campos, 06.XI.873 - low tree).
102. *Quassia amara* L.

Ochnaceae
103. *Blastemanthus* sp. (Tonantins, 24.XI.874 - tree 40-50 ft. flowers yellow).
104. *Gomphia* sp. (Rio Padauiri, in igapó, 26.VI.874).
105. *Gomphia* sp. = 382 Spruce (Monte Alegre, on campos, 06.XI.873).
106. *Gomphia* sp. = 3676 Spruce (Coari, 16.X.874 - low shrub, petals yellow, anthers orange).

Burseraceae
107. *Bursera* (*Protuim*) *pubescens* Engler (forest on Barreira de Maniuva [sic], Rio Purús, 29.IX.874 - low tree, flowers yellowish [...illegible].
108. *Bursera* sp.
109. *B.* (*Protium*) *divaricatum* Engl. (Coari, 16.X.874 - tree, 20 ft, petals & filaments yellow [...illegible].

Meliaceae
110. *Guarea* sp. (Manacapuru, in igapó, 05.IX.874 - tree, 30-40 ft., flowers pink).
111. *Guarea* sp. "Timbó" (Guaranasal [sic], Rio Tapajós, 15.III.874).

Chailletiaceae
112. *Chailletia vestita* Benth.
113. *Tapura* sp. (Rio Jutai, at 5° 12'S, 28.I.875 - tree 40-50 ft. & 18 inches diam.)

Olacaceae
114. *Aptandra spruceana* Miers. (Prainha, in thickets, 29.XI.873 - shrub, flowers white).
115. *Paraqueiba sericea* Tul. "Umiri" (Parauari, 20.X.874 - low tree).

Celastraceae
116. *Salacia* (section *Peritessa*) *dulcis* Kunth "Apéua" (Cararaucú [sic],in igapó, 17.IV.874 - tree, fruit edible).
117. *Salacia* sp. (Tonantins, 23.XI.874).
118. *Salacia* sp. (" , in igapó, 12.XII.874 - tree, 30 ft., flowers yellow).

Sapindaceae
119. *Serjania paucidentata* DC. (Prainha, XI.873)
120. *S. clematidae* Triana (Sao Paulo, in a boggy valley, 26.XI.874 - a climber).
121. *Paullinia cupana* Kunth "Guarana" (Rio Maués, 05.V.874 - cultivated).
122. *P. nobilis* Radlk. sp.n. (Tonantins, 23.XI.874).
123. *Cardiospermum corindum* L. = *microcarpum* H.B.K. (Prainha, 08.XII.873, on beach).
124. *Ratonia geminata* P. = 239 Spruce.
125. *Talissia* sp. = 1992 Spruce (Cachoeira Grande, Manaus, 27.XII.874 - tree).

Anacardiaceae
126. *Anacardium occidentale* L.

Leguminosae
127+a. *Indigofera anil* L. "Anil" (Monte Alegre, 06.XI.873).
128. *Tephrosia nitens* Benth. "Timbó" (Rio Curua, 29.XII.873).
129. *T. toxicaria* Pers. (Barreira de Monte Alegre, 28.XII.873).
130. *Sesbania exasperata* H.B.K. (Sao Paulo, by river, 11.XII.874 - shrub, 6-8 ft., flowers yellow).
131. *Chaetocalyx brasiliensis* Benth. (Santo Antônio, Rio Madeira, 28.V.874).
132. *Aeschynomene hispidula* H.B.K. (Lago Iripixi, Rio Trombetas, 26.II.874).
133+a. *A. sensitiva* S. "Parica" (Urubú Cachoeira [sic], Rio Juruá, 06.XI.874).
134. *A. hispida* Willd. "Jucari" (Monte Alegre, 05.XI.873; Manaus, 25.XII.874).
135. *A. hystrix* Poir. (Vila Bela, 06.IV.874).
136. *Soemmeringra semperflorens* Mart. (Nicolau, Rio Juari, 26.I.873).
137. *Stylosanthes angustifolia* Vog. (Monte Alegre, 12.XI.873)
138-9. *Zornia diphylla* P. (Manaus,12.VI.874).
140. *Z. diphylla* P. var. *pubescens* H.B.K.
141+a. *Desmodium barbatum* Benth. (Faro, Rio Jamundá, 11.IV.874)
142. *D. adscendens* DC. (Tonantins, 24.XI.874 - flowers pink).
143-4. *D. incanum* DC. (Banks of the Rio Parauaquara [sic], 04.XII. 873).
145a&b. *Centrosema pubescens* Benth. (Obidos, I.874; Santarém, 03.I.874; Tonantins, 24.II.874).
146. *Galactia jussieuana* H.B.K. (campos near Santarém, 08.I.874. - flowers red).
147. *Teramnus volubilis* Sw. (Nicolau, Rio Jauari, on a bush, 21.II.873. Rio Javari, 21.XI.873).
148. *Clitoria guianensis* Benth. (marshy, campo north of Prainha, 18.II.73 - pinnae subacute).
149. *Colpogonium* (section *Stenobium*) *brachycarpum* Benth.
150. *Captonema* sp.n.
151. *Dioclea bicolor* Benth. (campos of Santarém, 03.I.874 - shrub).
152. *Vigna luteola* Benth. (Sao Paulo, in varzea, 11.XII.874. - flowers yellow).
153. *Phaseolus longifolius* Benth. (Santa Ana, 27.XII.873 - flowers yellow).
154. *Dalbergia riparia* Benth. (Prainha, 18.XI.873 - flowers white).
155. *Ecastophyllum monetaria* P. (Carvoeiro, Rio Negro, 02.VII.874 - flowers white).
156. *Drepanocarpus crista-castrensis* Mart. (Prainha, near the beach, 18.XI.873 - tree).
157. *Drepanocarpus aristulatus* Spruce (Monte Alegre, by the Gurupatuba River, 24.X.873 - tree 20-30 ft., leaves bears many globular galls covered with pale brown hair).
158. *Drepanocarpus aristulatus*? (Monte Alegre, by the Gurupatuba River, 24.X.873).
159. *Pterocarpus rohnii* Vahl (igapó at Manacupurú, 05.IX.874 - tree, flowers rich yellow).
160. *Pterodon* sp.n. (Igarapé de Marapatá, 20.VII.874 - tree, 50-60 ft.).
161. *Swartzia benthamiana* Mig. (Igarapé da Colônia, Lages, in igapó, 21.VII.874 - tree).
162. *S. acuminata* Willd. (Lajes, in igapó, 04.VIII.874 - tree, flowers white, fruit large).
163. *Swartzia amazonica* sp.n. *Journ. Bot.*, 1878: 132 (Tonantins, 24.XI.874 - tree 40-50 ft. flowers in spikes cauline below the leaves; sweet scent).
164. *Sclerobium panicutalum* Vog. var. "Tani" (Prainha, on campo, 18.XI.873).
165. *Campsiandra laurifolia* Benth. "Acapu-rana" (Rio Jauari, below Prainha, 20.XI.873).
165a. *C. angustifolia* Benth. (Lajes, in igapó, 04.VIII.874 - tree, petals pink except white at base).
166. *Sclerolobium* or *Tachigalia* (Linda Vista, Rio Purús, 13.IX.874).

167. " " (Fonteboa, 17.XI.874).
168. Sclerolobium or Tachigalia (Barreiras de Unaham [sic], Rio Purús, 06.X.874 - all tree species of *Sclerobium* gathered, nº 166, 167, 168, had the leaves ant-tenanted).
169. *Caesalpinia pulcherrima* Sw. (Samaúma, Rio Tapajós, 09.I.874).
170. *Cassia occidentalis* L. "Pae-mari-uba" (Monte Alegre, XI.873)
171. *C. tora* L. (Prainha, on sand, 06.XII.873 - shrub).
172. *C. multijuga* Rich. var. "Flor de Sao Joao" (Humaitá, Rio Madeira, 30.V.874).
173. *C. racemosa* Mill. (sitio near mouth of Rio Padauiri, Rio Negro, 28.VI.874 - flowers yellow).
174. *C. hispidula* Vahl. (Monte Alegre, among sand, 12.XI.873).
175. *C. desvauxii* Collad. (Alter do Chao, Rio Tapajos, 07.I.874).
176. *C. curvifolia* Vog. (Prainha, 29.XI.873 - small shrub).
177. *C. patellaria* DC. (Caipurú, Rio Trombetas, 02.III.874).
178. *C. praetexta* Vog. (Lago Caipurú, Rio Trombetas, 02.III.874).
179. *Bauchinia longicrusis* Benth. var. (Capiranga, near Barreira de Monte Alegre, 29.XII.873).
180. *B. splendens* H.B.K. (Caburi [sic], Rio Negro, 19.VI.874).
181. *Heterostemon mimusoides* Desf. "Aiparí da terra firme" (Tonantins, 24.XI.874 - tree, 40 ft., flowers lavender).
182. *H. ellipticus* Mart. (Barreiras de Bacururú [sic], Rio Juruá, 12.XI.874 - tree, 8-15 high, stem 1½ inch thick, flowers lilac).
183. *Macrolobium multijugum* Benth. (near Rio Taruma, in igapó, 07.VII.874 - tree, 15-20 ft.).
184. *Hymenaea* or *Peltogyne* sp.n. (Monte Alegre, 04.XI.873).
185. *Peltogyne densiflora* Benth. (Lajes, in igapó, 04.VIII.874 - tree, sepals and petals yellowish green).
186. *Parkia discolor* Benth. (forest near entrance to Lago Caipuru, Rio Trombetas, 03.II.874).
187-8. *Neptunia oleracea* L. (Monte Alegre, in march, 09.XI.873; Obidos).
189. *Mimosa debilis* H.B.K. (Vila Bela de Parintins, 06.IV.874)
190. *M. spruceana* Benth. (hill near Igarapé da Colônia [sic], Lajes, 05.I.875. - flowers white).
191. *M. orthocarpa* Benth. (Lago Iripixi, 26.II.874).
192. *M. asperata* L.
193. *Mimosa* sp.n. (bank of Rio Amazon at Prainha, 18.XI.873 - low tree, 5- 15 ft., bore 2 species of *loranthus).*
194. *Calliandra trinervia* Benth.
195-6. *Pitheolobium adiantifolium* Benth. (Rio Negro, 64^0 W, 30^0 S, VI.874).
197. *P. panurense* Benth. "Inga" (Caburi [sic], Rio Negro, 19.VI.874).
198. *P. latifolium* Benth. (Obidos, 09.II.874).
199. *P. cauliflorum* Benth. (Obidos, 09.II.874).
200. *P. parvifolium* Benth. (Monte Alegre, 03.XI.873 - tree, 40-70 ft., legume spiral).
201. *Inga dumosa* Benth.
202-3 *I. nobilis* Willd. "Uiki" (Rio Parauaquara [sic], 05.XII.873.
204. *I. edulis* Mart. (Prainha, near beach, 18.XI.873 - tree).
205. *Inga* sp. aff. *verae* (Povoado [sic], 16.XII.873 - leaves galled).
206. " " (Parauaquara [sic], 05.II.874).
207. *Inga Ingoides* U.? "Ca-imba" (Erere, 27.X.873).
208. Gen. ? "Aiparí" (Igarapé da Colônia, Lajes, in igapó, 21.VII.874).

Rosaceae
209. *Chrysobalanus icaco* L. "Majuri" (Parauari, 20.X.87, shrubby tree, 10 ft. high).
210. *Licania heteromorpha* Benth. (Lajes, in igapó, 04.VIII.874 - tree).
211. *Moquilea* sp. aff. *floribundae* Benth. (above Xibarú [sic], Rio Negro, in igapó, 28.VI.874).
212. *Hirtella sp.* aff. *guaineae* Spr. (forest behind Manaus, 26.VIII.874).
213. *H. eriantha* Benth. (Coari, Rio Solimões, 16.X.874 - low shrubby tree).
214. *H. bicornis* Mart. (campos near Santarém, 20.XII.873 - low tree).
215. *H. americana* L. var.? (Prainha, in capoeira, 18.XI.873).
215a. *Hirtella* sp. (Mapapurú [sic], Rio Negro, 28.VI.874).

Combretaceae
216. *Buchenavia* sp. aff. *reticulata* (above Xibaru, Rio Negro, in igapó, 23.VI.874 - low tree).
217. *B. capitata* Eichl. (at Lajes, Rio Negro, in igapó, 04.VIII.874 - low tree).
218. *Combretum* (section *Jacquinia*) cf. *Jacquini* Greseb. (Prainha, by the Amazon, 27.XI.873 - low tree).
219. *Combretum* ? Locality lost.

Loganiaceae
219a. *Pogamea* sp.

Myrtaceae

220. *Campomanesia* sp. "Aratú" (Cararaucu, 15.II.874 - low tree, like guava).
221. *Psidium pyriferum* L. "Guava" (Prainha, in capoeira, 08.XI.873).
222. *Psidium* ? (Huitanaa, Rio Purus, 28.IX.874 - low tree).
223. *Myrcia ambigua* DC. (near Manaus, 24.VIII.874 - bush).
224. *M. negrensis* Bey (Caburi [sic], Río Negro, in igapó, 20.VI.874 - flowers white).
225. *Myrcia lanceolata* C.? (Barreiras de Monte Alegre [sic], 30.XII.873 - shrub).
226. *Myrcia* sp. (Monte Alegre, on campos, 05.XI.873 - shrubby tree).
227. *Myrcia* sp. (Santarém, on campos, 03.I.874 - shrubb, flowers white).
227a. *Myrcia* (section *Aulomyrcia*) *curalellifolia* Berg? (Almeirim, on campos, 19.II.875 - tree, 20-25 ft. high, flowers yellow).
228. *Myrcia* sp.? (Tonantins, 24.XI.874 - tree 30-40 ft., flowers white).
229. *Myrcia* sp.? (Tonantins, 23.XI.874 - tree 20-30 ft., flowers white).
230. *Eugenia egensis* DC.? (Tefé, 19.X.874 - low shrub, flowers white).
231. *Eugenia* sp. (Monte Alegre, 06.XI.873 - shrubby tree).
232. *Eugenia* sp. (" " , on campos, 12.XI.873 - shrubby flowers white).
233. *Eugenia* sp. (mouth of Rio Jaú, Rio Negro, 16.VI.874).
234. *Eugenia* sp. (igapó at mouth of Rio Negro, 31.XII.874 - tree 8-12 ft. high, flowers white).
235. *Eugenia* (section *Myrciaria*) (Utari, Rio Purus, 25.IX, 874 - shrubby cipó, fruits edible).
236. Gen.? *Psidio* aff.
236a. Gen.?

Melastomataceae

237-8. *Rhynchanthera grandiflora* DC. (marshy campo, Prainha, 18.XI.873).
239-41. *Nepsera aquatica* Naud. (Barcelos, 30.VI.874).
242. *Pterolepis trichostomia* Cogn. (campo near Rio Padauri, 28.VI.874).
243. *Macairea* sp. (Sao Paulo, Rio Solimões, in boggy valley, 06.XI.874).
244-6. *Tibouchina longifolia* Baill. (Sao Paulo, in boggy valley, 06.XI.874).
247-8. *Aciotis annua* Triana (Huitanaa, Rio Purús, 28.IX.874; Barreiras de Maniuva [sic], Rio Purús, 29.IX.874).
249-50. *A. circaeifolia* Triana (Ilha das Araras, Rio Madeira, 04.VI.874; Airao, Rio Negro, VI.874).
251-2.2a. *A. dysophylla* Triana (Prainha, in marsh, 08.XII.873; lower Monte Alegre, 10.XI.873; rock at fountain at Monte Alegre, 21.X.873).
253. *Aciotis* ? *dysophylla* (Barcelos, Rio Negro, 30.VI.874).
254-6 *Leandra solenifera* Cogn. = *Oxymeris heterobasis* Tri. (Barra de Unaa [sic], Rio Purús, 16.X.874; Barra de Japú [sic], Rio Juruá, 13.XI.874; Beruri, Rio Purús, 13.X.874).
257. *L. secundiflora* (Tri.) Cogn. "Tatacajuba" (Santarém Maloca, Rio Jutai, 4.II.875 - for use as a dye).
258-9. *Miconia nervosa* Tri. " Lacre" (Beruri, Rio Purús, 13.X.874; Paricatuba, 08.IX.874 - leaf crushed & rubbed with saliva to cuts, & heals them "in one third the time").
260-1. *M. alata* DC. (Prainha; Belém, 06.III.875).
262-3. *M. argyrophylla* Tri. (near Manaus, 13.VIII.874; right bank of Rio Negro, above Açaituba, 06.VII.874).
264. *M. ciliata* (DC.) Cogn. = *M. decussata* Don. (Belém, 06.III.875).
265. *Miconia* sp. (Tonantins, 23.XI.874).
266. *M. secundiflora* Cogn. (Prainha, in capoeira, 29.XI.873 - flowers white).
267. *M. traillii* Cogn. (Barreira Branca [sic], Rio Jutai, 03.II.875).
268. *Miconia* sp. (Tonantins, 23.XI.874).
269. *Miconia* sp. (Barreira de Japú [sic], Rio Juruá, 13.XI.874).
270. *Miconia* sp. " " " , 13.XI.874).
271. *Miconia* sp. (Cachoeira de Taruma, near Manaus, 31.VII.874).
272-3.*Tococa bullifera* Mart. var. (hill near Igarapé de Marapata [sic], near Manaus, 05.VIII.874; Mapapara [sic], near Cabuquem [sic], 29.VI.874).
274. *T. bullifera* Mart. (*teste* Cogn.) (South bank of Rio Maués, about 5^0 S, 03.V.874).
275-6. *T. guianensis* Aubl. (Açaituba, Rio Negro, 06.VII.874; Barcelos, Rio Negro, 30.VI.874).
276a. *Tococa macrophysea* Spruce (near Cachoeira de Tarumá, 31.VII.874).
277. *T. bullifera* Mart. (*teste* Cogn.) (woods near Prainha, 18.XI.873).
278. *T. egensis* Naud. (igapó, near Cachoeira de Tarumá, 01.VIII.874).
279. *T. coronata* Benth. (Povoado [sic], Rio Uruara, 14.XII.874).
280. *T. subciliata* DC. (*teste* Cogn.) (Coari, Rio Solimões, 16.XI.874).
281. *T. coronata* Benth. (Tauaria, Rio Purus, 16.IX.874).
282. *T. bullifera* Mart. (*teste* Cogn.) (near Rio Gurupatuba, West of Monte Alegre, 01.XI.873).
283. *T. coronata* Benth. (Povoado [sic], Rio Uruara, 11.XII.874).
284. *T. guianensis* Aubl. (Tefé, 19.X.874).
285. *T. guianensis* Aubl. (*teste* Cogn.) (Barreira de Maniuva [sic], Rio Purús, 29.IX.874).
286. *T. longifolia* Trail (Ms in Kew Hb.) (below rapids of Pacu Assu [sic], Río Maués, 01.V.874).
287. *T. trailii* Cogn. (Sao Bras, Rio Purús, 22.IX.874).
288. *T. capitata* Trail (Tauaria, Rio Purús, 16.IX.874).

289. *T. capitata* Trail (Lago Cerrado [sic], Rio Juruá, 30.X.874).
290-1. *Clidemia hirta* Don (above Aveiros, Rio Tapajós, 17.III.874; Aranja [sic], Rio Uruara, 13.XII.873).
292. *C. hirta* Don (*teste* Cogn.) (Beruri, Rio Purus, 13.X.874).
293-6. *C. tiliaefolia* DC. (near mouth of Rio Padauiri, 28.VI.874; 294-5 Barcelos, Rio Negro, 30.VI.874; Barreiras de Unaa [sic], Rio Purus, 06.X.874).
297. *C. rariflora* Benth. (Barcelos, Rio Negro, 30.VI.874).
298-302. *C. novemnervia* Tri. (Rio Negro, bank at about 64° W, 0°,30'S, 26.VI.874; Xibaru [sic], Rio Negro, 23.VI.874; Barcelos, 30.VI.874; mouth of Rio Padauiri, 28.VI.874; mouth of Rio Jaú, Rio Negro, 16.VI.874).
303. *C. naevula* Tri. (bank of Amazon at Obidos, 22.I.874).
304. *Miconia* aff. *nervosa* (Belém, 06.III.875).
305. *Clidemia* sp. (Beruri, Rio Purus, 13.X.874).
306. *C. rubra* M. = *Sagraea rubra* Tri. var. (Manaus, 12.VI.874).
307. (*Calophysa*) *Maieta tococoidea* Cogn. (Barcelos, in forest, 30.VI.874).
308-9. *M. guianensis* Aubl. (Fonteboa, Rio Solimões, 17.XI.874; Cachoeira de Taruma, near Manaus, 31.VII.874).
310. *Myrmidone macrosperma* M. (Cachoeira de Taruma, near Manaus, 01.VIII.874).
311. *Loreya minor* Cogn. sp.n. (Tonantins, 24.XI.874)
312. *Myriaspora egensis* DC. (Santa Ana [sic], Rio Javari, 08.XII.874).
313. Gen. ?
314. *Miconia ceramicarpa* Cogn. (Belém, 06.III.875).
315. *Miconia* sp. ?
316. *Miconia* sp. ?

Lythraceae
317. *Cuphea melvilla* (Ilha de Araua-assu [sic] below Prainha, 05.XII.873).
318. *Cuphea* sp.
319. *C. ramulosa* K. var.a. *hirta* K. (sand beach below Santarém, 22.XII.873).
320. *Lagerstroemia reginae* R.

Onagraceae
321. *Jussiaea ? ligustrifolia* (Prainha, on sand by Rio Amazon, 17.XI.873).
322-23. *J. pilosa* Kunth (Huitanaa, Rio Purús, 28.IX.874; Beach at Prainha, 17.XI.873).
324. *J. suffruticulosa* L. (Tonantins, 12.XII.874).
325-26. *J. erecta* L. (Barreiras de Monte Alegre, 28.XII.873; Huitanaa, Rio Purús, 28.VIII.874).
327-28-29. *J. decurrens* DC. (sandy beach at Manaus, 25.XII.874; Povoado [sic], Rio Uruara, 11.XII.873; Barreiras de Monte Alegre, 28.XII.873).
330. *J. affinis* DC. (Huitanaa, Rio Purús, 28.IX.874).
331. *J. repens* L. (sandy by stream near Manaus, 25.XII.874).
332. *J. ? repens* " " " "
332a. *J. natans* H.& B. (Lago Juruti, 03.IV.874).
333-34. ?

Samydaceae
335-36. *Casearia grandiflora* St. Hil. (Prainha - flowers white).
337. *C. javitensis* H.B.K.
338. *C. dentata* Aubl. (Prainha, 29.XI.873).
339-40 *C. javitensis* H.B.K.
341. *Homalium pedicellatum* Benth. (Lajes, mouth of Rio Negro, 04.VIII.874).

Turneraceae
342. *Turnera pumilea* L. (Prainha, by Rio Amazon).
343. *T. melochioides* C. var. *arenaria* Spruce (beach at Santarém, 02.I.874).
344-45-46. *T. ulmifolia* L., var. *surinamensis* Urban (Guaranasal [sic], Rio Tapajós, 06.III.874; Campo near Prainha, 18.XI.873; Campo at Almeirim, 19.II.875).
347. *T. acuta* Willd. (by house near Caburi [sic], Rio Negro, 19.VI.874).
348. *T. brasiliensis* Willd., var. *breviflora* Urban (campo near Santarém, 03.I.874. - low shrubb).
349-53. *Piriqueta cistoides* Meyer, var. *latifolia* Urban (Monte Alegre; Tauari, Rio Purus, 16.IX.874; Huitanaa, Rio Purus, 28.IX.874).
354. *Turnera acuta* Willd. (Igarapé de Marapata [sic], near Manaus, 23.XII.874 - shrub 3-4 ft. high, flowers orange).

Passifloraceae
355. *Passiflora foetida* Cav. "Maracuja" (Uara, 07.II.873).
356. *P. glandulosa* Cav. (Prainha, in capoeira, 17.XI.873).
357-8. *P. coccinea* Aubl. (Obidos, 26.I.874).

359 *Carica* (section *Vasconcellea*) (Resaca [sic], Rio Juruá, 01.XI.874 - low shrub, flowers white).
360. *C.* (section *Vasconcellea*) (Lago Cerrado [sic], Rio Juruá, 30.X.8740.

Cucurbitaceae
361. *Luffa operculata* Cogn. (Prainha, climbing on steep bank beside the Amazon, 06.XII.873).
362. *Momordica charantia* L. (Monte Alegre, 08.XII.873 - leaves rubbed on itch-spots to cure skin disease).
363. *Cucumis* (Fazenda Santa Ana, East of Santarém, 27.XII.873).
364. *Citrullus vulgaris* S. (Prainha, on sandy beach of Amazon, 29.XI.873).
365. *Melothria fluminensis* Gard. (label lost, received at Kew in V.875).
366. *Gurania villosa* Cogn. (Obidos, 27.I.874).
367. *G.* sp. (Porto Salvo, Rio Purús, 04.X.874).
368-9 *G.* sp. (Utari, Rio Purus, 28.IX.874; Sepatini, Rio Purús, in forest, 30.IX.874).

Begoniaceae
370. *Begonia spruceana* A.Dc. (Rio Jutaí, 5^0 12'S, on a fallen tree, 30.I.875.
371. *B.* sp. (Tabatinga, 30.XI.874).
372. *B.* sp. - Burchell 4434 (Sao Paulo, Rio Solimões, in boggy valley, 26.XI.874).
373. *B.* sp. (Gaviao, Rio Juruá, 10.XI.874, in epiphyte).

Ficoideae
374-6. *Mollugo verticillata* L. (Monte Alegre, 11.XI.873; Santarém, 02.I.874 - on sandy beach).

Umbelifereae
377. *Hydrocotyle natans* Cyr (Manaus, beside stream, 25.I.874).
378. *Eryngium foetidium* L. (Aranja [sic], Rio Uruara, cultivated, 13.XII.873 - used to flavour soup).

Araliaceae
379. *Didymopanax morototoni i* Muller

Rubiaceae
380. *Calycophyllum spruceanum* Benth. "Pau mulato" (Rio Juruá, in forest, 07.XI.874 - fine tree, 100-150 ft. high, 2-5 ft. diam).
381-2. *Warsiewiezia coccinea* DC. (382, in Obidos, 26.I.874).
383. *Sipanca acinifolia* Benth. (Jamaragua [sic], Rio Tapajós, on marshy beach, 10.I.874).
384-5. *S.* sp. (Obidos, in low forest, 22.I.874 & 11.II.874).
386-8. *Oldenlandia* sp. (Nicolau [sic], Rio Jauari, 21.XI.873; Manaus, 20.XII.874; Huitanaa, Rio Purus, 28.IX.874).
389. *Sabicea* sp. (Sao Paulo, Rio Solimões, in boggy valley, 26.XI.874 - shrub 1-2 ft. high, petals white).
390. *S.* sp. (Obidos, climbing on steep bank of Amazon, 22.I.875 - flowers white).
391. *S.* sp. (by house near Caburi [sic], Rio Negro, 19.VI.874 - flowers white).
392. *Bartiera parviflora* Benth. (Sao Paulo, Rio Solimões, in forest, 26.XI.874. - shrub 10 ft. high, flowers white).
393. *Sommera* sp. = Spruce nº1645, 4963 (Juruápuca [sic], Rio Juruá, in forest, 28.X.874 - shrub, petals white).
394. *Duroia saccifera* Mart. (Manaus, 11.II.875).
395. " " var.? (label lost).
396-a. *D. hirauta* K. Schum. (Tabocal, Rio Purús, in forest, 11.IX.874; Barreiras de Janico [sic], Rio Juruá, 12.XI.874).
397. *Basanacantha* sp. "Taquari" (Rio Jutaí, 5^0 12'S, 29.I.875 - shrub 4-5 ft. high, flowers greenish).
398. *Sphinctanthus rupestris* Benth. (sandy beach below Santarém, 22.XII.873 - shrub or low tree).
399. *Posoqueria longiflora* Aubl. var. (Cachoeira de Tapuruquara, Rio Negro, 25.VI.874).
400. *Retiniphyllum schomburghii* Benth. (on low hill by Rio Negro, at 64^0W 30'S, on campo, 24.VI.874 - petals white.
401. *Guetatarda grandiflora* S. (Prainha, in bush, 06.XII.873 - shrub, petals white).
402. *Chomelia* cf. *tenuiflora* Benth. (Serpa, 14.II.875 - shrub, 6-10 ft.).
403. *Ixora* ? (Barreiras de Monte Alegre, 10.XI.873 - low tree, cultivated).
404. *I.* ? (Monte Alegre, 10.XI.873 - low tree).
405. *I.* ? (forest at Cachoeira de Taruma, 31.VII.874).
406-7. *Faramea salicifolia* Presl. (Serra de Parintins, 01.IV.874).
408. *F. purpurea* Benth. (Rio Sapó, 21.XI.874, in igapó - shrubby tree, 15 ft. high, flowers blue, scented).
409. *F. anisocalyx* Poepp. (Barreiras de Pupunha [sic], Rio Juruá, 09.XI.874 - shrub, 4-6ft. high, flowers fragrant).
410. *Faramea* sp. (Sobral, Rio Purús, 21.IX.74 - small shrub, flowers blue).
411. *Psychotria* (section *Eupsychotria*) (Rio Javari, 06.XII.874 - shrub).
412. *P.* sp. Lago Cerrado [sic], Rio Juruá, in varzea, 30.X.874 - flowers white).

413-4. *P.* sp. (Sepatini, Rio Purús, in varzea, 20.IX.874; Sao Bras, Rio Purús, 22.IX,874 - low shrub).
415. *P.* (*Brachiata*) *bracteata* DC. (near mouth of Rio Padauiri, 28.VI.874 - shrub 4-5 ft. high, corolla pinkish white).
416. *P.* (*B.*) *inundata* Benth. (Obidos, 26.I.874).
417. *P.* (*B.*) (Paricatuba, Rio Purus, 12.X.874 - small shrubby tree, flowers white).
418. *P.* (*Patalea*) *nervosa* Benth. var. (Paricatuba, Rio Purús, in igapó, 12.X.874).
419-21. *P.* (*P.*) *barbiflora* DC. (421, Prainha, 08.XII.873).
422. *P.* (*Trichocephala*) *iodotricha* Benth. (Aranja [sic], Rio Uruara, 13.XII.873, in woods - flowers white).
423. *P.* (*Rudgeoides*) *fimbriata* Benth. (Rio Sapó, 21.XI.874).
424. *P.* (") (Porto Salvo, Rio Purus, 04.X.874 - shrubby tree, flowers white).
425. *Palicourea crocea* R.& S.
426. *P.* sp. = Spruce nº 1271 (Barreiras de Monte Alegre, in forest, 28,XII.873).
427. *P.* sp. = Spruce nº 3181 (Manaus, 24.XII.874 - shrub 3-4 ft. high, perianth carmine, tips yellow).
428-29 *Psychotria villosa* Benth. (Barreira de Monte Alegre, 28.XII.873; forest at Marapata [sic], Rio Negro, 30.XII.874 - shrub 1½-2½ ft. high).
430. *Geophila reniformis* Ch. & Sch. (Pariti [sic], Rio Purus, in clearing, 05.X.874 - flowers pink).
431. *Psychotria* (*Cephaelis*) *tomentosa* Willd. "Orelha de Cutia" (mouth of Rio Jaú, Rio Negro, 16.VI.874 - flowers white).
432. *P.* (*C.*) (Sao Bras, Rio Purus, in forest, 27.IX. 874 - flowers white).
433. *Diodia hyssopifolia* Ch. & Sch. (Huitanaa, Rio Purús, 28.IX.874).
434. *D. rigida* Ch. & Sch. (Nicolau [sic], Rio Jauari, 21.XI. 873).
435. *D. saponariaefolia* Schum. (Obidos, on bank of Amazon, 23.I.874).
436. *Spermacoce latifolia* DC. (near Prainha, in swamp, 08.XII.873 - flowers white).
437. *S.* sp. (Monte Alegre, on sand by river, 29.X.873 - herb.)
438. *S.* (*B.*) *ocimoidis* DC. (Prainha, on beach, 28.XI.873).
439. *S.* sp. (Cararaucu, 15.X.874).
440. *S. pusilla* Pohl. (Cararaucu, 15.X.874).
441. *S. ocimoidis* DC. (Airao, Rio Negro, 04.VII.874).
442. *Mitrocarpum scabrellum* Benth. (near lower Monte Alegre, 10.XI.873 - herb)..
443-5. *Perama hirsuta* Aubl. (marsh near Prainha, 06.XII.873).
446. *Staelia florida* Benth. (Santarém, on beach, 22.XI.873 - small shrub, flowers white).
447-50. Gen. ?

Compositae

451. *Pacourina edulis* Aubl. (marsh west of lower Monte Alegre, 06.XI.873).
452-3. *Vernonia* sp.
454. " (Alter do Chao, Rio Tapajós, 07.I.874).
455. *Piptocarpha opaca* Baker (Igarapé da Colônia [sic], Lajes, 21.VII.874 - tree in igapó].
456. *Elephantopus scaber* L. (sandy beach at Prainha, 17.XI.873).
457. *E. spicatus* Aubl. (Tonantins, 23.XI.874).
458. *Gymnocoronis* sp. (marsh at Prainha, 18.XI.873 - herb. white flowered).
459. *Ageratum conyzoides* L. (Abacaxis, 13.V.874).
460-1. *Eupatorium conyzoides* Vahl. (461, Monte Alegre, 29.10.873).
462. *E.* (section *Praxelis*) *asperulaceum* Baker (campo on Rio Padauiri, 26.VI.874 - flowers pink).
463. *E.* (section *praxelis*) *villosum* DC., var. (Igarapé do Bom Jardim, Rio Tapajós, 16.III.874.
464. *Mikania* sp. (igapó at Paricatuba, 12.X.874).
465-6. *M.* sp. (near lower Monte Alegre, 09.XI.873).
467. *Egletes viscosa* Less. (Huitanaa, Rio Purús, on hard clay, 25.IX.874).
468. *E.* sp. = Spruce nº 469 (Obidos, 26.I.874).
469-71. *Erigeron bonariensis* L. (470, Cararaucu [sic], 15.II.875).
472. *Clibadium surinamense* L. "Cunambi" (Rio Maués, 01.V.874 - used to poison fish).
473. *C. surinamense* L. (Barreira de Maniuva, Rio Purus, 29.IX.874).
474. *Melampodium camphoratum* L. (marsh at Prainha, 08.XII.873).
475. *M. hirsutum* Rich. var. (Manaus, 12.VI.874. - herb).
476-7. *Acanthospermum xanthoides* DC. (477, Prainha, 20.XI.873).
478. *Ambrosia artemisiaefolia* L. (sandy beach at Monte Alegre, 25.X.873).
479. *Enhydra anagallis* Gardn. (Monte Alegre, 10.XI.873).
480-1. *Eclipta erecta* L. (Manaus, 12.VI.874).
482. *Wulffia* sp. (Obidos, in forest, 26.I.874).
483-5. *Zexmenia rudis* (Benth.) Baker (sandy places near lower Monte Alegre, 14.XI.873; (484-5) Huitanaa, Rio Purus, 28.IX.874).
486. *Melanthera* ? *hastata* (Uara, Rio Solimões, 09.II.875).
487. *Spitanthes* ? *poeppigii* (Monte Alegre, on sandy place, 04.XI.873).
488-90. *Trichospira menthoides* HBK. (Nicolau [sic], Rio Jauari, 21.XI.873).

491-2. *Bidens pinnata* L.
493. *Pectis elongata* HBK. (Lago Iripixi, Rio Trombetas, 26.II.874).
494-6. *Erechthites hieracifolia* Raf. (495, Obidos, 22.I.874, in plantation).
497. *Emilia sonchifolia* DC., var. (Lago Caipuru, Rio Trombetas, 02.III.874 - flowers pink).

Campanulaceae
498. *Centropogon* sp. (Sao Paulo, in boggy valley, 26.XI.874 - shrub, 3 ft. high, corolla russet, with dull green tip).
499. *Lobelia aquatica* Cham. = Spruce nº 4404 (campo near Prainha, 18.XI.873).
500-1. *Sphenoclea zeylanica* Gärtn. (Sao Paulo, 11.XII.874).

Plumbaginaceae
502-3. *Plumbago scandens* L. (Santarém, beside the fort, 23.XII. 873 - flowers white).

Myrsinaceae
504. *Myrsine sp.*
505. *Cybianthus ? macrophyllus* M. (in forest at Tabocal, by mouth of the Parana-pixuna [sic], Rio Purus, 08.X.874 - small tree).
506. *C.* sp. = Schomburgh 963 (Monte Alegre, 08.XI.873 - tree).
507. *C.* sp. (Coari, 16.X.874 - tree 20 ft. height, flowers greenish-brown).
508. *Coromorpha glauco-rubens* Mez. sp.n. (Rio Negro, 64°W, o° 30'S, on low hill campo - tree, flowers yellowish white).
509. *Clavija parviflora* Benth. (Porto Salvo, Rio Purús, 04.X.874).

Sapotaceae
510. *Lucuma* sp. (in igapó at Lajes, Rio Negro, 04.VIII. 874).

Apocynaceae
511. *Plumieria attenuata* Benth. (St. Antonio, Rio Negro, in igapó, 06.VII.874 - flowers white, scent like cocoa-nut).
512. *Tabernaemontana rupicola* Benth. (igapó at mouth of Rio Jaú, Rio Negro, 16.VI.874).
513. *T. heterophylla* Vahl. (Serpa, 14.II.875).
514. *T. congesta* Benth. (Santarém, on campo, 22.XII.873).
515. *T. flavicans* R. & S. (Prainha, in capoeira, 20.XI.873).
516. *T.* sp. (campos near Monte alegre, 10.XI.873 - low tree, flowers white).
517. *Secondotia* sp. (igapó at Lajes, mouth of Rio Negro, 04.VIII.874 - shrubby tree, flowers white).
518. *A. geminata* (Muell.) (Barreiras de Monte Alegre, Rio Amazon, 28.XII.873 - climber, flowers yellow).
519. *Echites* sp. (Rio Jauari, 21.XI.873 - low climber).
520. *E.* sp. (Prainha, 06.XII.873 - shrub, flowers white).
521. *E.* sp. n. (near Carvoeiro de Tapuraquara, Rio Negro, 25.VI.874 - Cipó, flowers purple).
522. *Mandevilla* sp. (Airao, Rio Negro, 16.VI.874).
523. *M.* sp. (by house near Caburi [sic], Rio Negro, 19.VI.874).
524. *M.* (section *Amblyantha*) *versicolor* Mull.
525-6. *Rhabdadenia* sp. (Lago Caipurú, Rio Trombetas, 02.II.874; Obidos, in open place, in bush, 22.I.874).
527. *R.* sp. (Prainha, in bush, 18.XI.873 - climber).

Asclepiadaceae
528. *Philipertia* sp.
529. *Fischeria martiniana* Don. (Rio Javari, about 71°W - climber, sepals & petals white).
530. *Asclepias curassavica* L.
531. *Maderosperma traillianum* Benth. (g.n. & sp. n.) (Rio Padauiri, 26.VI.874 - petals yellow (a Rio Negro specie).
532. *Gonolobus viridiflorus* R. & S.
533-4. *Marsdenia* sp. = Burchell 7814, 815.

Loganiaceae
535. *Spigelia humilis* Benth. (edge of forest at Xibarú, Rio Negro, 23.IV.874 - low herb).
536. *Strychnos lanceolata* Benth. (Manaus, 24.XII.874 - climbing shrub, 3- 4 ft., perianth greenish white, anthers yellow).

Gentianaceae
537. *Coutoubea spicata* Aubl. (Jaguarari, Rio Tapajós, 11.I.874).
538-9. *C. ramosa* Aubl. (Coari, igapó, 16.X.874 - herb, sepals green, petals pink).
540. *Lisianthus spruceanus* Benth. (Rio Jutaí (Maloca-quara), 05.II.875).

541. *L. albus* Benth. (Rio Negro below Airao, 04.VII.874 - flowers white).
542. *L. uliginosus* Griseb, var. *grandiflorus* Gris. (Obidos, cliff by Rio Amazon, 22.I.874 - flowers lilac-blue).
543. *Pagoea recurva* Benth. (near Cachoeira de Tarumã, 31.VII.874 - flowers white).

Hydroleaceae
544. *Hydrolea spinosa* L., var. *inermis* (Huitanaa, Rio Purús, 28.IX.874).
545-6. *H. spinosa* L. (Monte Alegre, 06.XI.873).

Convolvulaceae
547. *Calystegia setifera* Poir. (Prainha, on beach, 18.XI.873).
548. *Ipomaea* sp. (Manaus, by small stream, 25.XII.874 - climber, leaves cordate, flowers small, white).
549. *I. quamoclit* L. (Rio Negro, below Airao, 04.VII.874).
550. *I.* sp.
551-2. *I.* (section *Aniseia*) *martinicensis* Choisy (Tabocal, Rio Purús, on beach, 11.IX.874; Airao, Rio Negro, 04.VII.874 - flowers white).
553. *I.* (section *Aniseia*) (Nicolau [sic], Rio Jauari, 21.XI.873).
554. *Jacquemontia tamnifolia* L. var. (Rio Negro, S. bank, above Manaus, 07.VII.874).
555. *Convolvulus* sp.
556-7. *Evolvulus saxifraga* Mart.? (557, beach at Santarém, 02.I.874).
558. *Breweria ferruginosa* Choisy (Manaus, 12.VI.874).
559. *B. glabra* Choisy (mouth of Rio Jaú, Rio Negro, 16.VI.874).

Boraginaceae
560. *Cordia nodosa* Lam. var.?
561. *C.* ? *umbrosa* Spr. (near Monte Alegre, 24.X.873 - ant-dwelling large hairy).
562. *C. micrandra* DC. (Prainha, 17.XII.873 - tall shrub, ant-dwelling large hairy).
563. *C. scabrifolia* DC. (Prainha, 18.XII.873).
564. *C.* sp. (Prainha, in bush, 26.XII.873 - flowers purple).
565. *Tournefortia* sp. (Cuiabá, Rio Purús, in varzea, 13.IX.874).
566. *T.* sp. (Prainha, 10.XII.873).
567. *Heliotropium indicum* DC. (Monte Alegre, on beach, 29.X.873).
568-70. *H. filiforme* H.B.K. (Lago Caipurú, Rio Trombetas, 02.III.874).
571. *H.* (*Schleidenia*) sp. = Gardner, 3358 (Rio Sapó, 21.XI.874).
572. *H. inundatum* Sm. (Prainha, on beach, 18.XI.873).

Solanaceae
573-5. *Solanum nigrum* L. (574, Barreiras de Matura [sic], 12.XII.874; 575, Obidos, in clearing, 23.VII.874).
576-7. *S. nigrum* L. (Tauaria [sic], 16.IX.874. 577, Monte Alegre, 03.XI.873).
578-9. *S. radula* Vahl (579, Prainha, 17.XII.873 - flowers white).
580. *S. acuminatum* R. & P. (Obidos, 23.I.874).
581-2. *S. heterophyllum* Lam.? (Prainha, 17.XII.873 - prickly shrubs, flowers purple).
583. *S.* sp. (sandy margin of Rio Negro where dry part of year, 25.XII.874 - shrub 2-4 ft.).
584-7. *S.* sp. (Rio Jauari, 28.X.874; beach at Lajes, 01.I.875; forest at Juruápuca [sic], 28.X.874; Xibarú, 64°W 30'S, 26.VI.874 - shrubs, petals white).
588-9. *S.* sp. (Prainha, in plantation; Boa Vista, Rio Jutaí, 02.II.875 - prickly shrub, 3-6 ft. high, flowers purple).
590-2. *S.* sp. (591-2, Prainha, 14.XI.873, 17.XII.873).
593. *Physalis pubescens* L. (Santa Ana [sic], 27.XII.873 - herb).
594. *P. angulatus* L. Santa Ana [sic], 27.XII.873 - herb, ?cultivated).
595. *Marchea* sp. (Barreiras de Monte Alegre, in forest, 28.XII.873 - flowers vermilion).
596. *Cestrum coriaceum* Miers. (in bush behind Berury, 13.X.874 - small tree, flowers white).
597. *C.* sp. (Guajaratuba, Rio Purús, 10.X.874 - flowers white).
598. *Nicotiana tabacum* L.
599. *Brunfelsia* (forest near Tabatinga, 30.XI.874 - bush 5-6 ft., flowers white).
600. *B.* sp. (Tonantins, 24.XII.874 - shrub 10-15 ft., flowers lavender).
601. *Schwenckia americana* L. (Prainha, on sand, 18.XI.873 - herb).

Scrophulariaceae
602. *Conobea aquatica* Aubl. (pool about 4 miles N. from Prainha, 18.XI.873 - small herb).
603. *C. sesperioides* Benth.
604-5. *Bacopa aquatica* Aubl. (marsh near Manaus, 28.VII.874).
606. *Tovenia parviflora* Benth. (Manaus, 25.XII.874).
607-8. *Vandellia crustacea* Benth. Huitanaa, Rio Purús, 28.IX.874; Lago Iripixi, Rio Trombetas, 26.II.874 - small herb).
609. *V. diffusa* L. (Airao, Rio Negro, 16.VI.874).

610. *Ilysanthes* (Monte Alegre, lower village, 29.X.873).
611. *I.* sp. (Manaus, 25.XII.874, by stream - small herb, flowers lavender).
612. *Hydranthelium egense* Popp. (Manaus, on sand by stream, 25.XII.874 - small herb, flowers pale lilac).
613. *Scoparia neglecta* (Prainha, on bank of Rio Amazon, 06.XII.873 - small herb).
614-7. *S. dulcis* L. (Monte Alegre, 10.XI.873; Prainha, 15.XII.873; Cararaucu, 15.II.875; Sao Paulo, on inundated river bank, 11.12.874).
618. *Camaria biflora* L.

Lentibulariaceae
619. *Utricularia pallens* St. Hil. (Obidos, 06.II.874).
620. *U.* sp. (marsh beside Rio Jauari, 24.XI.873).

Gesneraceae
621. *Gesnera* sp. (plantation near mouth of Rio Anavilhana, Rio Negro, 15.VI.874).
622. *Drymonia* sp. (Tonantins, 24.XI.874, in thicket - shrub, 5-6 ft. high, unbranched, fl. white).
623. *Alloplectus* sp. "Nariz de Mutum" (Gaviao, Rio Juruá, 10.XI.874 - epiphyte, bracts red, corolla dull yellow with scattered purple spots).
624. *A.* sp. (Sao Vicente, Rio Purús, in forest, 22.IX.874 - cipó).
625. *Besleria* sp. (forest near Rio Anavilhana, Rio Negro, 15.VI.874 - flowers white).
625a. Gen.?

Bignoniaceae
626. *Pyrostegia venusta* Ker (Prainha, in plantation, 26.XI.874).
627. *Bignonia jaminisfolia* H.B.K. (Barreiras de Bacururu, Rio Juruá, 12.XI.874).
628. *B.* sp. "carajurú" (Barcelos, Rio Negro, cultivated, 19.VI.874 - yields a red dye).
629. *B* (*Mansoa*) *difficili* aff.
630. *B.* (section *Arabidaea*) = Gardner 6064 (Prainha, in clearing, 20.XI.873 - flowers purple).
631. *B.* (*A.*) (Prainha, in clearing, 20.XI.873 - flowers purple).
632. *B.* sp. (Barreiras de Monte Alegre, 28.XII.873 - climber).
633. *Macfadyenor* sp.
634. *Glaziova* sp. (Rio Javari, 04.XI.874 - climbing on tree trunks).
635. *Bignonia* (*Cydiate*) *aequinostialis* L. (Prainha, 18.XI.873, on beach - climber on trees).
636. *B.* (*Memora*) *bilabiata* Sprague (Manaus, 25.XII.874 - Bush 4 ft. high, flowers dull pink).
637. *B.* (*Arabidaea*) (Utari, Rio Purús, 25.IX.874 - stem prostrate, flowers red).
638. *B.* (*A.*) *trailii* Sprague (Obidos, 23.I.874).
639. Manaus, 13.VIII.874).

Acanthaceae
640. *Mendoncia schomburghiana* Nees
641. *M.* sp. (Prainha, 08.XII.873 - climbing, flowers white with lilac marking).
642. *Ruellia beyriehiana* Nees (Prainha, 06.XII.873).
643. *R. terminalis* Nees (Sao Bras, Rio Purús, 22.IX.874 - flowers dull purplish-red).
644. *R.* (*dipterae*) sp. (Rio Jutaí, 5° 30'S, 30.I.875).
645. *R.* sp. (Tabatinga, 30.XI.874, flowers white).
646. *R.* sp. - "erva de rato" (Rio Jutaí, 01.II.875 - flowers semi-transparent pinkish-white with pink [ILLEGIBLE]).
647. *R.* (*Stephanophysum*) *cordifolium* Nees (Bank of Parauaquara, 01.XII.873).
648. *R.* (*S.*) *longifolium*, Pohl, var. (S. Antonio, R. Madeira, 28.V.874).
649. *Sanchezia* (S. Braz, R. Purus, 22.IX.874)
650. *Justeria polystachya* Nees (Prainha, 6.XII.873).
651. *J. pilosa* Nees (Sepatini, Rio Purús, 30.IX.874 - corolla 's upper lip lilac-tipped, lower lip lilac).
652. *Dianthera* (Monte Alegre, 03.XI.873).
653. *D. secunda* Gr. (Guaranasal [sic], R. Tapajós, 17.III.874).
654. *D. pectoralis* Nees (Prainha, 06.XII.873 - flowers white, lower lip has lilac markings).
655. *D.* (Section *Leptostachya*) (Juruápuca [sic], R. Juruá, in forest, 28.X.874 - corolla pale lilac with darker middle, stripe on lower lip).
656. *D.* sp. (S. Paulo, 11.XII.874).
657. *D.* sp. (forest on E. bank of R. Madeira, 01.VII. 874).
658. *D.* sp. (on dry places near lower village of Monte Alegre, 03.XI. 873).
659. *D.* (Section *Orthotactus*) (Utari, R. Purús, 25.IX.874 - flowers white).
660. *Beloperone* (Section *Simonsia*) (S. Antonio, R. Madeira, 28.V.874).
661. *Jacobinia coccinea* Nees (Pariti [sic], R. Purús, in shaddy ravine in forest, 05.X.874 - corolla crimson).

Verbenaceae
662. *Lantana camara* L. (Monte Alegre, 12.XI.873).

663. *Lippia geminata* H.B.K. (beach at Prainha, 17.XI.873).
664-65. *L. betulaefolia* Kunth. (664, Huitanaa, 28.IX.874; 665, Monte Alegre, on sandy soil near lower village, 12.XI.873 - herb.)
666. *Stachytarpha elatior* Schr. (Manaus, on sand, 25.XII.874 - 1 ft. high, flowers purple).
667. *S.* sp. (Icoulau [sic], beside R. Jauari, 21.II.873 - 1 ft. high; flowers purple).
668. *Amasonia punicea* Vahl. (Obidos, in "capoeira", 18.II.984).
669. *Petraea martiana* Schauer (Sao Bras, Rio Purús, 22.IX.874 - cipó in forest - climbing shrub, fls. lilac).
670. *P. efrinsignis* (igapó at Caburi [sic], R. Negro, 20.VI.874 - cipó, flowers purple).
671. *Vitex polygama* Cham. (Monte Alegre, 11.XI.873 - flowers lilac , fruit a sweet purple drupe).
672. *V.* sp. (Monte Alegre, 06.XI.873 (low tree, flowers personate).

Labiatae
673-75. *Marsypianthus hyptoides* Mart. (673, Prainha beach, 10.XI.873; 674, Cararaucu [sic], 15.II.875; 675, Pta. Jaguarari [sic], R. Tapajós, on marshy beach, 10.I.874 - herb, flowers blue).
676. *Hyptis atrorubens* Poit. (near Monte Alegre, 10.XI.873).
677. *H.* ? *brevipes* Poit. (label lost, received April 1874).
678. *Hyptis* (Prainha, on sand, 17.XI.873).
679. *H. spicata* Poit. (Prainha, on sand, 17.XI.873).

Nyctaginaceae
680. *Boerhaavia hirsuta* Willc. "Marcanina" (sandy beach at Prainha, 18.XI.873).

Phytolaccaceae
681. *Phytolacca icosandra* L. "Calabú" = "Carirú" in Demerara (mouth of R. Cuiara [sic], R. Negro, 15.VI.874, as weed in plantation).
682. *Microtea maypurensis* Don. (Airao, R. Negro, 04.VII.874 - a herb).

Polygonaceae
683. *Polygonum acuminatum* Kunth (Urubú Cachoeira [sic], R. Juruá, 06.XI.874).
684. *P. acre* H.B.K. (specimen not in Kew Hb.)
685. *Ruprechtia* sp. (Lajes, R. Negro, on beach, 01.I.875).
686. *R.* sp. = Ule 5987 (Marapata, R. Negro, on beach, 30.XII.874).

Amaranthaceae
687. *Amaranthus spinosus* L. (Huitanaa, R. Purús, 28.IX.874).
688. *A.* (*Euxolus*) *viridis* Mog. (Prainha, on sand, 17.XI.873).
689.
690.
691. *Gomphrena* sp. (sandy places, Monte Alegre, 14.XI.873).
692. *Cyathula achyranthoides* Mog. (Aranja [sic], R. Uruara, 13.XII.873 - 1½ ft. high).
693. *Alternanthera* (Urubú Cachoeira [sic], R. Juruá, 06.XI.874).
694. *A.* sp. (Prainha, on sand, 15.XI.873).
695. (*Telanthera dentata* Mog.) *Mogiphanes brasiliensis* (Prainha, on sand, 15.XI.873.
696. *Gomphrena globosa* L.
697. *G. glauca* Mog. (Nicolau [sic], Rio Jauari, 21.XI.873).

Chenopodiaceae
698. *Chenopodium ambrocioides* L. "Metrus" (cultivated at Monte Alegre, 12.XI.873).

Monimiaceae
699 *Siparuna* aff. *Chirodotae* (Barreiras de Unaham [sic], Rio Purus, 06.X.874).
700. *S.* sp. (Gaviao, R. Juruá, 11.XI.874).
701. Gen. nov.? (Lago Cerrado [sic], Rio Juruá, 30.X.874).

Lauraceae
702. (*Oreodaphne*) *Ocotea boissieriana* Meissn. (Aramanahy [sic], R. Tapajós, 10.I.874).
703. (*O. paraensis* Meissn.) *Ocotea laxiflora* Mez (det. 1887) (Aranja [sic], R. Uruara, 12.XII.873 - shrub, flowers pinkish).
704. *Nectandra vaga* Meissner (det. Mez 1887) "louro" (Prainha, on beach of Amazon, 28.XI.873 - low tree, flowers white)
705. *N.* sp. "louro" (Prainha, 28.XI.873 - flowers white).
706.

Thymelaeaceae

707. *Lasiadenia rupestris* Benth. (Marapata, mouth of R. Negro, on sandy beach, 31.xii. 874 - shrub, 2-4 ft. high).

Urticaceae
708. *Urera caracasana* Griseb. (R. Sapó, 21.10.875 - tree, 15-20 ft. high).

Artocarpaceae
709. *Trymatococcus amazonicus* Popp. (beside Igarapé de Manaus, 24.VIII.874 - a tree).
710. *Sorocea muriculata* Mig. (Barreiras de Pupunha [sic], Rio Juruá, 09.XI.874).
711. *S.* sp. (Tabocal, R. Purus. 10.X.874).
712. *S.* sp. (S. Bras, R. Purus, 22.IX.874 - shrubby tree).
713. *S.* sp. macho (Barreiras de Cariuvacanga [sic], R. Purus, 12.IX.874, in forest - small tree, flowers white).
714. *S.* sp. femea (in "varzea" at Guajaratuba, Rio Purús, 12.IX.874 - small tree, fls. white).
715. *Ficus* (section *Urostigma*) (mouth of R. Sapó, 06.II.875 - shrub 8-10 ft. high).

Cannabinaceae
716. *Cannabis sativa* L. "Tabaca blanca", "Iambo" "Drixi" (bank of Jamundá, 10.IV.874 - cultivated to be used like tobacco).

Salicaceae
717. *Salix martiniana* Leyh. (marshy beach at Prainha, 18.XI.873).

Euphorbiaceae
718. *Euphorbia thymifolia* Burm. (Prainha, on sand, 18.XI.873 - small herb).
719. *E. pipulifera* L. (Prainha, on marshy soil, 06.XII.873 - small herb).
720. *E. hypericifolia* L. (Monte Alegre, on shaded sandy soil, 29.X.873).
721-22. *Phyllanthus neruri* L. (721, Icou-lau [sic], R. Jauari, 21.XI.873; 722, Huitanaa, R. Purús, 28.IX.74).
723. *P. congestus* (Rio Javari, 05.XII. 874).
724. *P. piscatorum* H.B.K. "Timbo Cunambi", used to poison fish (Parauari, R. Solimões, 20.X.874 - shrub about 10 ft high, fls. white, bruised leaves used in fishing).
725. *Croton palanostigma* Klotzech (Tabatinga, 20.XI.874).
726. *C. matourensis* Aubl., var. *Benthamianus* Müll. (Manaus, 11.II.875 - tree, 20-30 ft. high, flowers nearly white).
727-28. *C. lobatus* L. (727, Nicolau [sic], Rio Jauari, 21.XI.873).
729-30. *C. asperrimus* Benth. (730, on sand at Prainha, 10.XI.873).
731-33. *C. chamaedrifolius* Griseb. (731, Monte Alegre, 10.XI.873).
734. *C. glandulosus* L., var. *subinermis* Müll. (Prainha, in jungle, 08.XII.873).
735. *C. glandulosus* L., var. *hirtus* (beside R. Jauari, Icoulau [sic], 21.XI.873 - herb).
736. *Iulocroton argenteus* Diderich (Barreiras de Monte Alegre, 28.XII.873 - shrubby herb, about 2 ft. high).
737. *I. gardneri* Muell. Arg. (Manaus, beside small stream, 25.XII.874 - flowers white).
738-39. *Hevea discolor* Benth. "Seringa barriguda" (R. Abacaxis, 10.V.874; 739, Lajes, mouth of R. Negro, in igapó, 04.VIII.874).
740. *H. ?discolor* "Seringa barriguda" (bank of R. Jauari, 22.XI.873).
741. *H. nigra* Ule (Boa Vista, R.Jutaí, 02.II.875).
742-44. *Caperonia palustris*, St. Hil. (742, Manaus, beside small stream, 25.XII.874, flowers white; 743, Prainha, 20.XI.873; 744, beside R. Jauari at Icoulau [sic], 21.XI.873).
745. *Acalypha ?macrostachya* Jacq. (Tabatinga, 30.XI.874 - shrubby tree).
746. *A. ?scandens* Benth. (Tabatinga, 30.XI.874 - shrub, inflorescences green).
747. *A. alopeeuroides* Jacq. (Cararaucu [sic], 15.II.874).
748. *A.* sp. (woods at Ereré, 24.X.873)
749-51. *Alchornea cordata* Müll. (749, on terra firme, at R. Sapó, 21.XI.874 - tree, 20 ft. high; 750, Tefé, 19.X.874, climbing shrub; 751, Coari, 16.X.874, low shrubby tree).
752-53. *A. cordata* Müll. (both from Tonantins).
754. *Pera cocinea* Müll. (Obidos, 25.II.874 - low tree, flowers red or yellow).
755. *P.* sp. (igapó at mouth of R. Jau, R. Negro, 16.VI.874).
756. *Pogonophora* sp.
757. *Manihot utilissima* Pohl. (Rio Sapó, 21.XI.874).
758. *Mabea ?paniculata* Benth. (Pta. Jaguarari, R. Tapajós, 11.I.874 - large tree on beach, bore loranth n° 784).
759. *M.* sp.
760. *M. speciosae* Muell aff (Igarapé da Colonia [sic], Lajes, 23.VII.874 - shrub in igapó).
761. *Senefeldera multiflora* Mart. var. (Tabocal, R. Purús, 10.X.874, in forest - small tree).
762. *Sebastiana corniculata*, Müll. (Nicolau [sic], beside R. Jauari, 21.XI.873).
763. *Sebastiana corniculata* var. *angustifolia* Müll. (" ").
764. " " *micrantha* Müll (Santarem, 24.XII.873).

765. (*Excoecaria biglandulosa* Müll., var.) *Sapium* (*S. lateriflora* aff.) Hemsley in "Icones Plantarum" (Prainha - slender tree, 15-25 ft. high, branches give copious milky sap yelding rubber).
766. *Dalechampia scandens* L. (Prainha, in bush, 08.XII.873 - climber).
767. *D. affinis* Müll. (Monte Alegre, 06.XI.873 - climber).
768. *D.* sp. (Tonantins, 24.XI.874 - climber, bracts yellowish-white, fls green).
769. gen?
770. *Sapium ciliatum* Hemsley, n. sp. (*Icones Plantarum*, 2683) (Cararaucu [sic], 15.II.874 - tree, 12-15 ft high, yielding a milky sap from which rubber coagulates).

Lacistemaceae
771. *Lacistema Pubescens* Mart. (Prainha, 18.XI.873).
772. *L. grandifolium* Schnizl. (Manaus, 13.VIII.874).

Aristolochiaceae
773. *Aristolochia* sp. (Barreiras de Maniuva [sic], R. Purús, 29.IX.874 - flowers yellow).
774. *A.* sp. (Tonantins, 24.XI.874 - flowers purplish-brown).

Loranthaceae
775. *Loranthus* (*Psittacanthus*) ?*biternatus* Hoffm. = Spruce 331 (Santarem, on trees on campo - flowers red).
776. *Loranthus* (*Psittacanthus*) Spruce [illegible] (Prainha, 18.XI.873 - 2 species mixed, on mimosa sp. n. nº 193).
777. *L.* (Section *Struthanthus*) *flexicauli* Mart. aff. (Monte Alegre, on campo, 18.XI.873 - a climber).
778. *Loranthus* (Section *Struthanthus*)
779. *L.* " (Obidos, 10II.874 - on leaf of *Didymopanea morototonii*).
780. *L.* (*Str.*) (Obidos, 09.II.874).
781. *L.* " (Prainha, by the Amazon, on mimosa).
782. *L.* " (Campos near Santarem, 03.I.874).
783. *L.* " (R. Sapó, 21.XI.874 - off *Theobr. cacau*).
784. *L.* sp. (Ponta Jaguarari, R. Tapajós, on bushes, 11.I.874).
785. *L.* sp. (R. Sapó, 21.II.874 - off *Th. cacao*).

Piperaceae
786. *Peperomia* aff *Myrtilla*
787. *Piper Warakaboura* C.Dc. (Maniuva, R. Purus, 29.IX.874).
788. *P. geniculatum* Swartz. (Coari, R. Solimões, 14.X.874).
789. *P. nitidum* Vahl. (Sao Bras, R. Purús, 23.IX.874).
790. *P. guianense* C.Dc. (Sobral, R. Purús, in varzea, 17.IIIX.874).
791. *P. dilatatum* Rich. (Matura, R. Solimões, below R. Juruá, 22.X.874).
792. *P.* sp. (Utari, R. Purús, 25.IX.874).
793. *P.* sp. (Prainha, 28.XI.873).
794. *P.* sp. (Guara, R. Solimões, in forest, 11.XII.874).
795. *P.* sp. (Almeirim, on campo, 17.II.875)
796. *P.* sp. (Beruri, R. Purús, 13.X.874).
797 *P. tenue* Kunth (Sao Paulo, R. Solimões, in forest, 11.XII.874).
798. *P.* sp. (Barreiras de Cariuacanga, R. Purús, 10.X.874).
799. *P.* sp. (R. Juruá, 07.XI.874).
800. *P.* sp. (Coari, R. Solimões, 16.X.874).
801. *P.* sp. (Coari, R. Solimões, 16.X.874).

Podostemaceae
802. *Rhyncholacis macrocarpum* Tul. an *hydrocichoreum* Tul. (Rapido of Porteira [sic], R. Trombetas, 02.III.874).

GYMNOSPERMA

Cycadaceae
803. *Zamia* sp. (Barreiras de Pupunha, Rio Juruá, 09.XI.874 - stemless).

MONOCOTYLEDONES

Cannaceae

804. *Thalia geniculata* L. (Barreiras de Monte Alegre, 20.XII.873).
805. *Canna* sp. (Lago Caipuru [sic], R. Trombetas, 02.III.874).
806-07. *Calathea* sp. (806, varzea at Sobral, Rio Purús, 17.IX.874).
808. *Maranta* sp. (Cararaucu [sic], 15.II.875 - 4-5 ft high).
809. *Ischnopogon pleurospicatus* (received without label IV.874).
810. gen

Scitaminaceae
811. *Hedychium* sp.

Musaceae
812. *Heliconia psittacorum* L. "Pacovinha do mato" (Pará, 06.III.875).
813. *H. ?brasiliensis* Hook (Parauacu [sic], R. Trombetas, in forest, 26.II.874).
814. *H.* sp.
815. *H.* sp. (Utari, R. Purús, 25.IX.874 - 5-6 ft high, peduncule & basal half of each fl. dark red, apical half of fl. green).
816. *H.* sp. (Humaitá, R. Madeira, on campo, 30.V.874).

Orchidaceae
817. *Pleurothallis* sp.

Amaryllidaceae
818. *Bomarea ?* Brauniana Schenck (Uricurituba, Rio Tapajós, 17.III.874 - climbs over bushes).
819. *Griffina* sp. (in forest at Sepatini, Rio Purús, 10.IX.874 - herb sub [illegilbe], capsula coral-red).

Haemadoraceae
820-21. *Xyphidium (album* Willd.) *floribundum* Sw. (Guaranasal [sic], Rio Tapajós, 16.III.874; Tabatinga, 30.XI.874).

Dioscoreaceae
822. *Dioscorea piperifolia* H.B.K. (in forest at Obidos, 22.01.874 - climber, flowers green).
823. *D.* sp.

Alismaceae
824. *Alisma* sp. (Bank of Rio Parauaquara, 04.Xii.873).

Palmaceae
825. *Bactris trichospatha* Trail
826. " " " var. *robusta* Trail
827-29. " " "
830-31. " " "
832. " " "
833. " " " var. *robusta* Trail
834-836. " "
837. *B. maraja* Mart.
838. " " subsp. *sobralensis* Trail
839. *B. trichospatha* Trail
840.
841. *B. trichospatha* Trail, var. *robusta* Trail
842-43. *B. maraja* Mart. subsp. *limnaia* Trail
844. *B. sphaerocarpa* Trail, var. *platyphylla* Trail
845. *B. piranga* Trail
846. *B.* aff. *simplicifrondi* Mart.
847. *B. gaviona* Trail
848. *B. pallidispina* Mart.
849. *B. curuena* Trail
850-51. *B. cuspidata* Mart.
852. *B.* "
853. *B. cuspidata* Mart. (= *B. floccosa* Spr.)
854. " " " var. *angustipinnata* Trail
855. *B. aristata* Mart.
856. *B. turbinocarpa* Barb. Rod.
857. *B. longipes* Popp.
858. *B. longipes* Popp., var. *exilis* Trail
859-60. *B. chaetospatha* Mart.

861. *B. pectinata* Mart., subsp. *microcarpa* Spr., var. *nana* Trail
862. " " *microcarpa*
863. " " subsp. *hylophila* Spr., var. *setipinnata* Barb. Rod.
864. " "
865. " " subsp. *turbinata* Spr.
866. " "
867. " " subsp. *turbinata* Spr.
868. " " subsp. *hylophila* Spr., var. *subintegrifolia* Trail.
869. " " subsp. *hylophila* Spr., var. *subintegrifolia* Trail.
870. " " subsp. "
871. " " subsp. *turbinata* Spr.
872. " " " var. *spruceana* Trail
873. *B. pulchra* Trail
874-75. *B. elegans* Trail
876. *B. pulchra* Trail
877. *B. concinna* Mart.
878. " var. *depauperata* Trail
879. *B. cuspidata Mart.* (= *B. floccosa* Spr.)
880. " var. *coriacea* Trail
881-82. *B. acanthospatha* Trail
883. *B. tormentosa* Mart.
884. *B. capillacea* Trail
885-87. *B. bidentula* Spr.
888. *B. balanophora* Spr.
889. *B. trailiana* Barb. Rod.
890-91. *B. syagroides* Trail
892. *B. aculeifera* Drude, an *B. longifrons* Mart. var.
893. *B. acanthocarpa* Mart. var, *crispata* Drude
894. *B. riparia* Mart.
895-96. *B. fissifrons* Mart.
897. *B.* " var. *robusta* Trail
898-99. *B. sphaerocarpa* Trail
900-01. " "
902. " " var. minor Trail
903-04. *B. sphaerocarpa*
905. " " var. *ensifolia* Trail
906. " " subsp. *pinnatisecta* Trail
907-08A. *B. bifida* Mart.
909. " " var. *humaitensis* Trail
910-11. Bactris bifida Mart. var *puruensis* Trail
912-13. *B. constanciae* Barb.Rod.
914-16. *B. mitis* Mart., var. *inermis* Trail
917-18. " " "
919. " " aff. "
920. " " var. *tenuis* (Wallace)
921-23. " *simplicifrons* Mart., var. *brevifolia* (Spr.)
924-25. " " "
916-27. " " var. *intermed.*
928-34. " " "
935-37. " " var. *negrensis* (Spr.)
938. " " var. *intermed.*
939. " " var. *carolensis* (Spr.)
940. " " var. *subpinnata* Trail
941. " *acanthocarpoide* Barb. Rod. (fruits only).
942. *Geonoma multiflora* Mart.
943. *G. paniculigera* Mart. var. *papyracea* Trail.
944-49. *Geonoma paniculigera* Mart. var. *microspatha* (Spr.)
950. " " " subvar. *pacimoniensis* (Spr.)
951. " " var. *microspatha* (Spr.)
952. " " near "
953-58. " " var. *cosmiophylla* Trail
959. " " var. *papyracea* Trail
960. " " var. *graminifolia* Trail
961. *Calyptronoma robusta* Trail
962-63. *Geonoma leptospadix* Trail

964-66. *G. aspidiifolia* Spr.
967-71. *G. laculifera* Kunth., var. *macrospatha* Spr.
972-75. *G. spiniiana* Mart.
976. *G. tamandua* Trail
977-79. *G. camana*
980-81. *G. spruceana* Trail, subsp. *tuberculata* (Spr.)
982. " " " " var. *major*
983. " " " "
984. " " " " " "
985. " " " "
986-8. " " subsp. *intermedia* Trail
989-92. " " " "
993-4. " " subsp. *compta* Trail
995-7. " " " "
998-9. *Geonoma spruceana* Trail
1000-2. *Geonoma spruceana* Trail
1003-5. " "
1006-7. " " var. *heptasticha* Trail
1008-9. " " " "
1010-2. *Geonoma masrostachys* Mart.
1013-4. *Geonoma acaulis* Mart.
1015-6. " "
1017. " "
1018. *Geonoma* sp.
1019-21. *Geonoma oligoclona* Trail
1022-4. *Geonoma laxiflora* Mart.
1025-8. *Geonoma pycnostechys* Mart.
1029. " " var. *glabra* Trail
1030. *Geonoma arundinacea* Mart.
1031-4. *Geonoma elegans* Mart. var. *amazonica* Trail
1035-6. *Chamaedorea pauciflora* Mart.
1037-41. *Chamaedorea gracilis* Willd.
1042-3. *Morenia integrifolia* Trail
1044. " " var. *nigricans* Trail
1045-8. *Hyospathe elegans* Mart.
1049. *Euterpe oleracea* Mart?
1050. " " seedlings
1051. " *catinga* Wall.
1052. *Oenocarpus minor* Mart.
1053-4. *Iriartea exorhiza* var. *orbigniana* Mart. (sp)
1055. " " var. *philonotia* Barb. Rod. (sp)
1056. *Iriartea exorhiza* young plant
1057. *Iriartea ventricosa* Mart.
1058. *Catoblastus pubescens* Krt. var. *krinocarpa* Trail
1059-61. *Iriartea setigera* Mart.
1062-3. *Leopoldinia major* Wall.
1064. *Leopoldinia piassaba* Wall..
1065-8. *Leopoldinia pulchra* Mart.
1069. *Manicaria saccifera* Gartn. var. *mediterranea* Trail
1060. *Martinezia caryotaefolia* H.B.K.
1071. *Astrocaryum minus* Trail
1072. " *farinosum* Barb. Rod.
1073. " *javarense* Trail
1074. " *rodriguezii* Trail
1075. " *jauari* Mart. (fruits)
1075a. *Desmoncus phengophyllus* Drude
1076. " *orthacahnthus* Mart var. *trailiana* Dr.
1077. " *polyacanthus* var. *oxycanthus* Mart. (sp)
1078. *Desmoncus polyacanthus*
1079. " *orthacanthus* Mart. var. *trailiana* Dr.
1080-2. " *setosus* Mart.
1083-5. *Desmoncus mitis* Mart.
1086. " *pumilus* Trail
1087. " *palustris* Trail
1088-9 " *polyacanthus* Mart. *aereus* n.sp. Dr.

1090-1. " *leptospadix* Mart.
1092. *Lepidocaryum tenue* Mart. *L. sexpartitum* B. Rod. var. *microcarpum* Dr.
1093. *Lepidocaryum tenue* Mart.
1094. " "
1095. " " Mart. (6-partitum) *L. sexpartitum* B. Rod. var. *microcarpum* Dr.
1096. *Lepidocaryum tenue* Mart. (*guianense* Spr.)
1097. " " " (Rio Javari)
1098-9. *Lepidocaryum tenue Mart.* (*guianense* Spr.)
1100-1. " " " (Rio Javari & Tabocal).
1102. *Mauritia aculeata* Humb.
1103. " (*Orophoma) ca.ana* Wall.
1104. *Attalea? speciosa* Mart. (Aramanaí)
1105. *Attalea* sp.
1106. *Bactris* (*trichospatha* Trail?)
1107. *Bactris actinoneura* Drude & Trail
1108-9. " *eumorpha* Trail
1110-1. " " subsp. *arundinacea* Trail
1112-4. " *oligocarpa* Trail
1115-6. " *juruensis* Trail & var *lissospatha* TRail
1117-8. " *trichospatha* Trail subsp *jurutensis* Trail
1119. " *incommoda* sp.n.
1120. " *arundinacea* Trail sp.n.
1121. *Oenocarpus baccaba* Mart.? young
1222. *Cocos inajai* Trail
1223. *Elaeis melanococca* Gaertn.
1224. " (*Barcella*) *odora Trail*
1225. *Cocos cocoides* Mart.

Pandaneae
1126. *Carludovica trailiana* Drude (Parauari, 20.X.874).
1127. " *latifrons* Drude (Rio Jutaí, 5° 12'S, 29.01.875)
1128. " sp.
1129. " *divergens* Drude (Gaviao & Japú, 11.XI.874)

Burmanniaceae

1130. Gen? = 2492 Spruce

Aroideae / Araceae
1131.
1132. *Monstrea* sp. (Serpa, 14.II.875).
1133. " ? (Lago Tapagem, R. Trombetas, 28.II.74 - epiphytic climber).
1134. *Monstrea obliqua* Sch. (S. Vicente, R. Purús, in forest, 22.IX.74 - epiphytic climber, leaves entire).
1135. *Heteropsis* sp. (Igarapé da Colonia [sic], Lajes, R. Negro, 21.VII.874 - igapó tree, spathe white.
1136. *Urospatha spruceana* Sch. Manaus, 12.II.875, in marshy place - leaves & spathes brown, spadin yellow green.
1137. *Urospatha* (*hostmanni* Sch.) *poeppigiana* Sch. (Manaus, in marsh. 12.VIII.874
1138. *Anthurium acaule* (Rio Jutaí, 5° 12'S, 29.I.875)
1139. *Anthurium* sp. "corôa" (Utari, R. Purús, 25.IX.874).
1140. (Barreiras de Mutum [sic], Rio Jutaí, 02.II.875.

Smilacaceae
1141. *Smilax papyracea* Duham (Rio Jutaí, at 5° 6'S, 19.I.895 - yields sarsa of Rio Jutaí).
1142. *S. verisimiliter* sp.n. A.Dc. in Hb. Kew (Pararauari, 20.X.874 - stem with strongly dentate ridges on angles, yields commercial sarsa of Rio Purus)
1143. *S. santaremensis* A.Dc. var. *subarmata* A.Dc. n. var. (Obidos, 24.I.874).

Pontederiaceae
1144. *Pontederia cordifolia* Mart. (Manaus, on sandy beach, 25.XII.874).

Commelynaceae
1145. *Dichorisandra villocula* Mart. (Prainha, on sand, 18.XI.873).
1146. *D. aubletiana* R.&S. (Prainha, on sand, 26.XI.873).
1147. *Floscopa peruviana* Hassk. var *perforans* (Gaviao, Rio Juruá, 11.XI.874).

1148-9. *Aneilema laxiflorus* Benth. (beside Rio Jauari, 24.XII.873).
1150. *Commelyna virginica* L. "madia molho" (Prainha, on sand, 26.XI.873). 1151. " *erecta* L. (Prainha, on sand, 26.XI.873).
1152. " *nudiflora* L. var. *glabra* "Madia molho" (sandbeach at Prainha, 19.XI.873).
1153. *Commelyna nudiflora* L. var. *agraria* (beside small stream at Manaus, 25.XII.874).

Xyridaceae
1154. *Abolboda grandis* Griseb. var. *minor* (near Cachoeira de Tarumá, near Manaus, 31.VII.874).
1155. *Xyris laxifolia* Mart. (marshy campo near Prainha to north, 18.XI. 873).
1156. *Xyris pallida* Mart. (campo near Prainha, 18.XI.873).

Eriocaulaceae
1157. *Tonina fluviatilis* Aubl. (marshes near Monte Alegre, 10.XI.873)
1158. *Paepalanthus perpusillus* Kunth. (marshy beach at Jamaragua [sic] , R. Tapajós, 12.I.874).
1159. *P.* sp. (marshy campo near Prainha, 18.XI.873).
1160. *Paepalanthus* sp. (campo near Lago Arapixuna [sic], Rio Trombetas, 05.III.874).

Cyperaceae
1161. *Kyllingia caespitosa* Nees (Huitanaa, Rio Purús, 28.IX.876).
1162. " *pungens* Link (Monte Alegre, in marshy places, 08.XI.873).
1163. *Cyperus* (*articulatus* Vahl) *corymbosus* Rathb. "piripirioca" (Utari, R. Purús, 25.IX.874 - rhizoma used as a perfume).
1164. *Torulinium confertum* H. (Monte Alegre, on marshy ground, 12.XI.873).
1165-6. *Cyperus luzulae* Rottb. (1165, Monte Alegre, in marsh, XI.873; 1166, Huitanaa, R. Purús, on hard clay, 28.IX.874).
1167-70. *Cyperus* (*elegans* Vahl) *diffusum* Vahl. (1167, Lago Caipuru, R. Trombetas, 02.III.874; 1168, Monte Alegre, 08.XI.873; 1169, Barreiras de Januari [sic], R. Solimões, 13.I.875; 1170, beach at Lajes, R. Negro, 06.I.875).
1171-72. *Cyperus compressus* L. (beach at Lajes, R. Negro, 06.I.875).
1173-75. *Cyperus sphacelatus* Rottb. (1173, Monte Alegre, in marsh, 10.XI.873; 1174, Lajes, R. Negro, 06.I.875; 1175, Manaus, 25.XII.874).
1176. *Cyperus esculentus* L. (beach at Lajes, R. Negro, 06.I.875).
1177. *Mariscus filiformis* H.B.K. (Lago caipurú, R. Trombetas, 02.III.874).
1178. *Mariscus* sp.
1179. *Cyperus trailii* C.B. Clarke, n.sp. (Manaus, beside small stream, 25.XII.874).
1180. *Hippolytrum longifolium* Nees (campo near cliff on R. Jauari, 24.XI.873).
1181. *Diplasia karataefolia* Rich. "rabo de lontra" (Barreira alta [sic], R. Jutaí, 03.II.875).
1182. *Fimbristylis* (*brizoides* Nees) *diphylla* Vahl. (Guaranasal [sic], R. Tapajós, 16.III.874).
1183. *Fimbristylis vahlii* Lenk (beach at Lajes, R. Negro, 06.I.875).
1184. " *diphylla* Vahl. (Huitanaa, R. Purús, 28.IX.874).
1185-6. " *limosa* Kunth. (1185, Lajes, R. Negro, 06.I.875; 1186, Huitanaa, R. Purús, 28.IX.874.
1187. *Fimbristylis limosa* Kunth. (Manaus, on sand by small stream, 25.XII.874).
1188. (*Trichostylis*) *Bulbostylis junciformis* Kunth, var. *conostachya* B. (Santarém, on campos, 03.I.874).
1189-90. *Oncostylis* sp.
1191-92. *Eleocharis amazonica* C.B. Clarke (1191, Aranja [sic], R. Uruara, 13.XII.873; 1192, Prainha, on campo to north, 18.XI.873).
1193. *Dichromena ciliata* Vahl. (Prainha, on campo, 29.XI.873).
1194. *Mariscus* sp. (Santarém, on campo, 14.I.874).
1195 (*Holoschoenus*) *Rhynchospora longispicata* Boeck. (marsh near cliff by R. Jauari, 14.XI.873).
1196. (*Haplostylis barbata* Ness.) *Rh. pterocarpa* (R. & S.) (Guaranasal [sic], R. Tapajós, 16.III.874).
1197-8. *Rh. cephalotes* Vahl. (1197, near Obidos, 28.I.874; 1198, marsh near cliff by R. Jauari, 21.XI.873).
1199. *Rh.* (*Cephaloschoenus*) *globosa* (Nees.) Britton (marsh near cliff, by R. Jauari, 24.XI.873).
1200-1. (*Ephippiorhynchium polycephalum* Nees.) *Rh. cyperoides* Britton.
1202. *Rh. viridi-lutea* C.B. Clarke, sp.n. (Kew Bull. Add. Ser. VII, p.36, 1908) (marsh at Prainha, 06.XII.873).
1203. *B. fimbriata* Nees. (campo near Lago Arapixuna [sic], R. Trombetas, 05.III.874).
1204. *Pleurostachys sparsiflora* Kunth, var. *trailii* C.B. Clarke "tiririu" (Cararaucu, 18.IV.874 - 15-20 ft. high among bushes, very troublesome, cutting one's skin.
1205. *Calyptrocarya intermedia* C.B. Clarke, sp.n. (Barreiras de Jauarapi [sic], R. Solimões, in forest, 13.I.875).
1206. (*Ophryo*)*Scleria macrocarpa* Nees. (Huitanaa, R. Purús, 28.IX.874).
1207. (*Omo*)*Scleria reflexa* H.B.K. (by R. Gurupatuba W. of Monte Alegre, 08.XI.873.
1208. *Cryptangium* (*uliginosum* Schr) *leptocladus* Boeck. (L. Arapixuna, R. Trombetas, 05.II.874).
1209. *Calyptocarya* (*Palmetto* Nees) *intermedia* C.B. Clarke (Prainha, on marshy ground, 06.XII. 873.

Graminaceae
1210. *Oryza sativa* L. (Rio Trombetas, in the river growing wild, 05.III.874).

1211. *Pharus brasiliensis* Raddi. (Barreiras das Araras [sic], 15.XI.874).
1212-3. *Reimaria acuta* Flügge (1212, Lajes, R. Negro, on beach, 06.I.875; 1213, Manaus, beside small stream, 25.XII.874).
1214-6. *Paspalum conjugatum* Berg. (1214, pastures at Conceiçao, R. Negro, 16.VI.874).
1217-8. *Paspalum (undulatum* Poir) *plicatulum* M. (specimens not in Kew).
1219-22. *Paspalum plicatulum* Nees, var. *spiculis minoribus* (1219, Cararaucu, 15.II.875; 1220, Lajes, R. Negro, on beach, 06.I.875; 1221, Barreira de Monte Alegre, 28.XII.873; 1222, Huitanaa, R. Purús, 28.IX.874).
1223-5. *Paspalum fasciculatum* Willd. (1223, Cararaucu, 15.II.875; 1224, Lajes, on beach, 06.I.875; 1225, L. Iripixi, R. Trombetas, 16.II.874).
1226. *Paspalum papillosum* Spr. var. *glumis glabris* (received at Kew, nov. 1874, label lost).
1227. *Paspalum chrysodactylon* Trin (campo above Escovado, R. Tapajós, 15.III.874).
1228. *Paspalum (*Serpens Nees.) *pusillum* V. (Huitanaa, R. Purús, 28.IX.874).
1229. *Paspalum urcomum* Nees. (campo above Escovado, R. Tapajós, 15.III.874).
1230. *Paspalum platycaule* Poir. (Pasture at Conceiçao, R. Negro, 16.VI.874).
1231. *Olyra concinna* Hookf? (see Bot. Mag. Tab. 7469) (Barreiras de Janico [sic], R. Juruá, 12.XI.874).
1232. *O. semiovata* Trin. (Barreiras de Maniuva [sic], R. Purús, in forest, 29.IX.874).
1233-34. *O. acutinoda* Spr. (1234, L. Iripixi, R. Trombetas, 26.II.874).
1235-36. *Panicum zizanioides* Kunth. (1235, Lajes, R. Negro, on beach, 06.I.875; 1236, Caracaucu, 15.II.875).
1237. *Panicum leucophaeum* Kunth. (Cararaucu, 15.II.875).
1238. " *trichanthum* Nees. (specimen not found in Kew Hb).
1239. " " (Cararaucu, 15.II.875).
1240. " *elephantipes* Nees. (specimen not found in Kew Hb.).
1241-42.Panicum *cayannense* Lam. (1241, Lajes, on beach, 06.O.875; 1842, Cararaucu, 15.II.875).
1243.44. *Panicum stoloniferum* Poir. (1243, Santarém, Rio Jutaí, 04.II.875; 1244, L. Iripixi, R. Trombetas, 26.II.874).
1245. *Panicum laxum* (S. Paulo, in boggy valley, 26.XI.874).
1246. " *pilosum* Sw. (Conceiçao, R. Negro, 16.VI.874. - A small form).
1247-48. *Panicum pilosum* (*trichophorum* Sch.) (1247, Caburi, R. Negro, 19.VI.874, very fine; 1248, L. Iripixi, R. Trombetas, 26.II.874).
1249-50. *Panicum rivulari* aff (1249, Cararaucu, 15.II.875; 1250, by R. Gurupatuba, W. of Monte Alegre, 08.XII.873).
1251. *Panicum rugulosum* Trin. (near lower village of Monte Alegre, 10.XI.873).
1252. *Panicum speciosum* Nees. (Uara, R. Solimões, 07.II.875).
1253. *Panicum* (*Digitaria*) *horizontale* (Willd.) (Cararaucu, 15.II.875.
1254. *Isachne polygonoides* (Lam.) Doll. (S. Paulo, in boggy valley, 26.XI.874).
1255. *Panicum* (*Oplismenus-*) *crus-galli* Kunth var. *sabulicola* (Lajes, R. Negro, on beach, 06.I.875).
1256. *Panicum* (*O.*) *spectabile* Kunth (forest near L. Iripixi, R. Trombetas, 26.II.874).
1257-60. *P.* (*Setaria*) *imberbe* var. *geniculatum* (1257, Huitanaa, R. Purús, 28.IX.874; 1258, Lajes, R. Negro, 06.I.875; 1259, Utari, R. Purus, 25.IX.874; 1260, Manaus, 25.XII>874).
1261-62. *P.* (*Setaria*) *imberbe* var. (1261, dry spot in igapó, R. Sapó, 21.XI.874).
1263. *P.* (*S.*) *Setosa* Beauv. (river bank, Monte Alegre, 22.X.873).
1264. *Cenahrus echinatus* L. (Prainha, on sand, 15.XI.873).
1265. *Pariana sylvestris* Nees? (Aramanaí, Rio Tapajós, 10.I.874).
1266. *Aristida longifolia* Trin. (Almeirim, on campo, 19.II.875).
1267. *A. capillacea* Lam. (Humaitá, R. Madeira, on campo, 30.V.874).
1268. *Cynodon dactylon* Pers. (Prainha, on beach, 08.XII.873 - large).
1269. *Eleusine aegyptiaca* Willd. (Prainha, on beach, 08.XII.873).
1270. *Gymnopogon foiosum* Willd. (Assutuba [sic], R. bank of R. Negro, on small campo about 30 yds square, 06.VII.874).
1271-73. *Leptochlox scabra* Nees. (specimens not found in Kew).
1274. *L. virgata* Beauv. (cararaucu, 15.II.875).
1275. *Eleusine indica* G. (specimen not found in Kew Hb.).
1276-8. *Neeregrostis reptans* (Michx.) (1276, Hyutanaa, R. Purús, 28.IX.874; 1277, Marshy & dry places near lower village of Monte Alegre, 10.XI.873; 1278, Manaus, 25.XII.874).
1279. *Eragrostis maypurensis* Kunth (specimen not found in Kew Hb.)
1280. *Guadua macrostachya* Rupr? Monro (received at Kew from "upper Amazon", April 1875, label lost).
1281. *G. angustifolia* Kunth? Monro "Tabocal" (S. bank of R. Negro above Thomar [sic], 23.VI.874 - grows almost erect or waving to height of 40 or 50 ft., bears a rather close & large head of branches, diam. of stem near ground 4-5 inches, internodes 7 or 8 inches. Wood said to be poisonous, & used for making lance & arrow-heads).
1282. *G. tagoara* (specimen not found in Kew Hb.)
1283. *Orthoclada mariflora* Beauv. (Almeirim, on campo, 19.II.875).
1284. *Trachypogon polymorphus* Hack., var. (Almeirim, on campo, 19.II.875).
1285. ? *Panicum* (Humaitá, R. Madeira, 20.V.874).

CRYPTOGAMIA

Filices

1286. *Polypodium decumanum* Willd. (Aranja [sic], R. Uruara, 13.XII.873, in axils of Urucuri palm - fronds 6-7 ft.).
1287. *P. lepidopteris* Kze (Sao Paulo, off calabash tree, 26.XI.874).
1288. *P. tetragonum* Sw. (forest at Guajaratuba, R. Purus, 10.X.874).
1289. *P. lanceolatum* L. (Barreiras de Tabatinga, R. Juruá, 13.XI. 874 - epiphyte).
1290-91. *P. percussum* Cav. (1290, on dead wood in forest, Porto Salvo, R. Purús. 06.X.874; 1291, climber on tree in igapó, R. Sapó, 21.XI.874).
1292. *P. schomburgkianum* Kze. (near mouth of L. Iripixi, R. Trombetas, 26.II 874).
1293-94. *P. neriifolium* Schk. (Ponta Jaguarari, R. Tapajós, 11.I.874 - epiphyte.
1295-96. *P. lycopodioides* S. (Jamaragua [sic], R. Tapajós, 12.I.874; 1296, igapó, R. Sapó, 21.XI.874 - epiphyte on trees).
1297-98. *P. piloselloides* L. var. (1297, bank of R. Jauari, 22.XI.873 - fronds ovate, acute; 1298, forest, S. Paulo, 26.XI.874 - fronds lanceolate, obtuse - epiphytic on trees).
1299. *P. persicariaefolium* Schr. (bank of R. Jauari, 22.XI.873 - climber).
1300-01. *P. repens* L. (1300, R. Jutaí, 5° 12'S, 29.XI.875; 1301, Gaviao, R. Juruá, 11.XI.874).
1302. *P. elasticum* Rich. (cliff near Trovadores, R. Tapajós, 12.III.874).
1303. *P. incanum* Sw. (Cararaucu, 16.IV>874 - epiphytic).
1304. *P. crenatum* Sw. (by R. Tapajós above Aveiros, 17.III.874).
1305. *Nephrolepis acuta* Presl. (Aranja [sic], R. Uruara, 13.XII.873 - in anils of Urucuri palm).
1306-07. *Nephrodium macrophyllum* Baker (1306, Serra de Parintins, 01.IV.874. 1307, by R. Tapajós, above Aveiros, 17.III.874).
1308-13. *N. subquinquefolium* H.B.K. (1308, Barreiras de Japu-uaté [sic], R. Juruá, 13.XI.874; 1309, Cararaucu, 18.IV.874; 1310, Aramanai, R. Tapajós, in forest, 09.I.874; 1311, by R. Tapajós above Aveiros, 17.III.874; 1212, near L. Arapacu, R. Trombetas, 04.III.874; 1313, Pariti, R. Purús, in forest, 05.X.874).
1314-15. *N. subquinquefolium* H.B.K. var. (1314, Serra de Parintins, 01.IV.874; 1315, West bank of R. Maués, 04.V.874).
1316. *N. unitum* R.Br. (Cararaucu, 17.IV.874).
1317. *N. tetragonum* Hook. (S. Paulo, in boggy ground, 26.XI.874).
1318. *N. lepriaurii* Hook. (Barreira de Japú, R. Juruá, 13.XI.874).
1319-20. *Aspidium semicordatum* Sw. (1319, cliff near Trovadore, R. Tapajós, 12.III.874; 1320, cliff on E. bank of R. Maués, near rapids, 30.VI.874).
1321. *Asplenium radicans* Schk. (Pariti, R. Purús, 05.X.874).
1322. " *sylvaticum* Presl. (Pariti, R. Purús, in gully in forest, 05.X.874).
1323-24. *Aspelnium cuneatum* Lam. (1323, Barreiras de Jutaí, R. Solimões, 18.I.875; 1324, Barreiras de Japu-uaté, R. Juruá, 12.XI.874).
1325-26. *Asplenium hallii* Hook. (1325, S. Antonio da Boa Vista, R. Javari, 06.XII.874; 1326, R. Javari, 06.XII.874).
1327-28. *Asplenium lunulatum* Sw. (not seen in Kew Heb.).
1329. *Asplenium salicifolium* L. (R. Jutaí, 5° 12'S, 29.I.875).
1330-32. *Asplenium serra* ? (not seen in Kew Hb.).
1333. " *angustum* Sw. (Cararaucu, 17.IV.874).
1334. *Ceratopteris thalictroides* Brongn. (marsh West of Prainha, 15.XI.873 - young plants bud from a broader frond).
1335. *Adiantum villosum* L. (by R. Tapajós above Aveiros, 17.III.874).
1336. " *pulverulentum* L. (Serra de Parintins, 01.IV.874).
1337-39. " *tetraphyllum* Willd. (1337, by R. Tapajós above Aveiros, 17.III.874; 1338, Barreiras de Ipiranga, R. Purus, 11.X.874).
1340-43. *Adiantum hirtum* Kl. (1340, near L. Arapecu, R. Trombetas, 04.III.874; 1341, Aranja, R. Uruara, 13.XII.873; 1342, by R. Tapajós, above Aveiros, 16.III.874; 1843, Barreiras das Araras, R. Solimões, 15.XI.874).
1344-46. *Adiatum kaulfussii* Kze. (1344, cliff near Trovador, R. Tapajós, 12.III.874; 1345, cliff on E. bank of R. Maués near rapids, 30.IV.874; 1346, rapids of Porteira, R. Trombetas, 02.III.874).
1347. *Adiantum intermedium* Sw. (S. Paulo, 11.XII.874).
1348-49. *Adiantum lunulatum* Burm., var. (1348, rocks below cliff at Barreiras de Monte Alegre, 28.XII.873; 1349, near Trovador, R. Tapajós, 12.III.874).
1350. *Pteris pungens* Kaulf (Gaviao, R. Juruá, in forest, 11.XI.874 - fronds rise from ground to 6 ft. high).
1351. *Pteris biawrita* L. (Serra de Parintins, 01.IV.874).
1352. " *aquilina* L. (R. Padauiri, R. Negro, 26.VI.874).
1353. *Blechnum occidentale* L. (not seen in Kew Hb.)
1354. *Lindsaya trapeziformis* Dry (Prainha, in forest, 28.XI.873).

1355-56. *L.* " var. *falcata* (1355, near Cachoeira de Tarumá, near Manaus, 21.VII.874; 1356, W. bank of R. Maués, on clay, 04.V.874).
1357. *Lindsaya* sp.
1358. *Davallia inaequalis* Kze. (Barreiras de Japú, R. Juruá, 13.XI.874).
1359. *Trichomanes sprucei* Baker (Cachoeira de Tarumá, near Manaus, on wet rocks, 31.VII.874).
1360-64. *Trichomanes brachypus* Kze. (1360, East bank of R. Maués, near lowest rapids, 30.IV.874; 1361, Cachoeira de Taruma, 31.IV.874; 1362, Cararaucu, 17.IV.874; 1363, Barreiras das Araras, R. Solimões, 15.XI.874; Manaus, 26.VIII.874).
1365-66. *Trichomanes prieurii* Kze. (1365, Cachoeira de Tarumá, 31.VII.874; 1366, R. Jutal, 5° 12'S, 29.I.875).
1367. *Trichomanes bancroftii* Hook. (Cachoeira de Tarumá, on moist rocks, 29.VII.874).
1368-72. *Trichomanes pinnatum* Hedw. (wpecimens not seen in Kew Hb.)
1373-75 " " var. *vittaria* (1373, Parauacu, R. Trombetas, 26.II.874, in forest; 1374, Juruári, R. Tapajós, 08.I.874; 1375, Aramanaí, R. Tapajós, 10.I.874).
1376. *Trichomanes crispum* Sw. (Cachoeira de Tarumá, on moist rocks, 31.VII.874).
1377. *Trichomanes heterophyllum* H.B.K. (marshy campo on R. Padauiri, 26.VI.874 - a large form).
1378. *Hymenophyllum fucoides* Sw. (Cachoeira de Taruma, on wet rocks, 31.VII.874).
1379. *Alsophila prosera* Kaulf. (Barreiras de Japu-uaté, R. Juruá, 13.XI.874 - stem 5 ft. high, I inch thick).
1380-81. *Alsophilla ferox* Presl. (1380, by a creek at L. Juriti, 04.IV.874 - stem 9 ft. high, middle pinna of leaf 3 ft. long.; 1381, near Manaus, 13.VIII.874 - stem 2 ft. high, fronds 8-9 ft. long).
1382. *Alsophila armata* Presl. (Barreiras de Japu-uaté, R. Juruá, 13.XI.874 - stem 2 ft. high, frond 12 ft. long).
1383. *Alsophila blechnoides* Hook. (campo near L. Arapixuna, R. Trombetas, 05.III.874).
1384. *Hemitelia trailli* Baker, sp.n. (glen in forest on East bank of R. Maués, 30.IV.874 - stem 4 ft. high, plant [...illegible].
1385. *Hemitelia subincisa* Kze. var. (specimen not in Kew Hb.).
1386. *Gleichenia pectinata* Presl. (W. bank of R. Maués, 04.V.874).
1387. " *pubescens* H.B.K. (specimen not seen in Kew Hb.).
1388. *Aneimia oblongifolia* Sw. var. *humilis* Sw. (cliff by R. Tapajós, at Escovado, 19.III.874).
1389. *Ophioglossum palmatum* L. (igapó at Assutuba, R. Negro, 06.VII.874)
1390. *Schizaea ?pennula* Sw. (specimen not seen in Kew Hb.)
1391. " *elegans* Sw. (Barreira Alta, R. Solimões, 03.II.875).
1392.-93. *Lygodium venustum* Sw. (1391, Cararaucu, 16.IV.874; 1393, Aranja, R. Uruara, 13.XII.874 - climber pinnae very [...illegible]).
1394-95. *Acrostichum sorbifolium* L. (1394, LInda Vista, R. Purús, 12.IX.874 - climbing on trees in varzea; 1395, not seen in Kew Hb.)
1396. *Hemionitis citrifolia* Hook. (Aranja, R. Uruara, 13.XII.873, in axils of Urucuri palm).
1397. *Antrophysum cayennense* Kaulf. (R. Jutaí, 5° 12'S, 29.I.875).
1398. *Monogramme immersa* Fée (Fonteboa, on tree, 17.XI.874).
1399-01. *Vittaria lineata* Sw. (1399, Ponta Jaguarari, R. Tapajós, 11.I.874; 1400, Igarapé de Marapata, Rio Negro, on stem of *Leopoldinia pulchra*, 28.XII.874; 1401, on tree at Capiranga below Santarem, 29.XII.873).
1402. *Meniscium reticulatum* Sw. var. *kepplerianum* Fée (cliff on East bank of R. Maués near lowest rapids, 30.IV.874).
1403-05. *Meniscium reticulatum* SW. (1403, near R. Gurupatuba West of Monte Alegre, 08.XI.873; 1404, by R. Maués, 06.V.874; 1405, Barcelos, R. Negro, 19.VI.874)).
1406. *Meniscium serratum* Cav. (S. Paulo, 26.XI.874).
1407. *Taenitis furcata* Willd. (Escovado, R. Tapajós, on tree, 19.III.874).
1408-09. *Gymnogramme rufa* Desv. (1408, Cararaucu, 16.IV.874; 1409, Serpa, in low "bush", 14.II.875).
1410-11. *Gymnogramme pumila* Spreng. (1410, Maracana forest, 10.IV.874; 1411, Igarapé de Marapata, R. Negro, 18.XII.873, on stem of *Leopoldinia pulchra*).
1412-15. *Gymnogramme calomelanos* Kaulf. (1412, rock at the fountain, Monte Alegre, 29.X.873; 1413, Huitanaa, 28.IX.874; 1414, Obidos, 22.I.874; 1415, S. Antonio, R. Madeira, 28.V.874).

Selaginellaceae

1416. *Selaginella ovalis* Baker sp.n. (Journ Bot. 1889, p.143) (cliff on E. bank of R. Maués near lowest rapids, 30.IV.874).
1417. *Selaginella puberula* Kl. (campo near R. Padauiri, R. Negro, 26.VI.874).
1418. *Selaginella* sp.
1419. *Selaginella parkeri* Spr. (west bank of R. Maués, 04.V.874).
1420-21. *Selaginella asperula* (1420, campo near Rio Padauiri, R. Negro, 26.VI.874; 1421, near Manaus, in the bush, 13.VIII.874).
1422-30. *Selaginella parkeri* Spr. var. *stellata* (1422, Aranja, R. Uruara, 13.XII.873; 1423, Alter do Chao, R. Tapajós, 07.I.874; 1424, Trovadore [sic] R. Tapajós, 12.III.874; 1425, by R. Tapajós, above Aveiros; 1426, Maracana, 09.IV.874; 1427, Obidos, 25.III.874; 1428, Cachoeira de Tarumá, 07.VIII.874; 1429, Cararaucu, 17.IV.874; 1430, S. Paulo, 24.XI.874).

1431-35. *Selaginella breynii* Spring. (1431, forest on R. Marnellos [sic], R. Madeira, 02.VI.874; 1432, Serra de Juruti, 03.IV.874; 1433, Conceiçao, R. Negro, 16.VI.874; 1434, Cararaucu, 17.IV.874; 1435, Cachoeira de Taruma, near Manaus, 31.VII.874).
1436. *Selaginella eladorhizans* A.Br. (limestone rocks at Trovadore [sic], R. Tapajós, 12.III.874).
1437. *Selaginella homaliae* A.Br. (Cachoeira de Tarumá, near Manaus, 31.VII.874).

Lycopodiaceae
1438-39. *Lycopodium cernuum* L. (1438, cliff on West bank of R. Maués, 04.V.874; 1439, swamp near Santarém, 14.I.874)

Appendix III. Correspondence between James W. H. Trail and Joseph Hooker and the staff at Kew, concerning Trail's activities in the Amazon region. The letters are deposited at the Archives of the Royal Botanic Gardens, Kew, and have never been reproduced. Original spelling maintained; illlegible words are indicated.

Letter No. 01:

Santarem
3rd January 1874

Dr. Hooker C.B.

Dear Sir

Since my arrival in South America nothing of sufficient importance has occurred in my experience to justify my troubling you with a letter, & my chief object in writing you at present is to say that before leaving Santarem, probably in about a fortnight from this time, I expect to send home a bundle of dried plants for the Kew Herbarium. I find that the way we have had to get through the work of surveying as yet has not been favourable to making a large collection, so I have had to be content with three or four specimens of a plant & not unfrequently have had to pass by plants altogether from not having facilities for collecting them at the moment. Up to the present time we have had to do without the steamer promised us, owing to the difficulty of obtaining one of suitable size; & we have had to fix our headquarters in the small towns, working from them as centres in boats or on horseback. The consequence has been that any plants in press when we left our headquarters to go to survey any district have been usually much the worse on our return owing to want of the papers being changed.

However I the less regret this that as yet we have been only in Districts from which I imagine the Herbarium at Kew already has plants, and that nothing of value has been lost worth mentioning.

By our latest ILLEGIBLEE the promised steamer will soon be sent us now & I shall have greater facilities for the requisite care and stowage of the plants before we come to the less known parts of the Amazon or its branches. About sending fruits and other objects in fluids I am a good deal puzzled as I do not know what are already in Kew Museum, & I am apt to think that everything I see must have been already sent if worth sending, specially on the banks of the Amazon itself, & I do not wish to send a lot of useless things. I am finding out from the Kew Museum guides as well as I can what objects have already been sent, but even with this help I am in difficulty about it.

As regard sections of trees, Mr Brown [ILLEGIBLE] specially to look after & to be responsible for expenses incurred, is of opinion that our instructions do not allow of incurring the expense of sending such home, as he considers that the Board empowered us only to send dried plants. If you think it worth paying their carriage I shall try to get specimens of any sorts which you think it would be desirable for the Museums at Kew to have. Owing to the difficulty of getting labourers here it is difficult to get a tree felled when wanted, so I have not got specimens of the commercial woods yet.

I shall send a few specimens showing Loranthaceae of three or four species growing on various trees, in the hope of their being of use. Is it possible to send home living specimens of Loranthaceae, they are numerous here & some are very handsome.

By the same post as this letter I send a small parcel in cloth containing seeds of a *Calliandra, & of Tephrosia* sp. the roots of which are here used as a fish poison under the name of "Timbó", a name which is also given to a sipo or creeper, more powerful in its action, & therefore prohibited by government here.

As regards the species of Melastomaceae bearing bullae on the leaves I have found one of which I take to be *Myrmedone formicaria*. This one is common both at Monte Alegre & at Prainha. In regard to both species I must say that after careful observation I am quite at a loss to determine the exact connection between the bullae & the ants, of which at least 3 spp. inhabit them. Neither plant seems especially liable to the attacks of other insects, in fact if anything they are more free from such attack than most other plants here.

The leaves of the Myrmedone frequently bear hardly any trace of bullae even on the same twig on which occur largely developed bullae, & the same holds in regard to the other plant, as maybe seen by specimens which I shall send home. Ants are usually to be found in those on *M. formicaria*, but not by any means constantly, while sometimes they are taken possession of by solitary bees & wasps.

The other plant is still more puzzling of it I have as yet seen only 2 bushes. In one of them every bulla was tenanted by ants; on the other not one was so occupied though the bulliferous leaves bore numerous small ants nests on their under surface, commonly just over the orifices (see herbarium). I have also found hollow swellings inhabited by ants on the steam of a shrub (also in the Herbarium) near Para, at Ereré, & at Prainha; & also ants inhabiting swellings in the twigs of a species of Cassia? but of these last I lost my specimens.

I remain
Yours respectfully & sincerely

James W. H. Trail

Letter No. 02:

Obidos
24th January 1874

Dear Sir

By the steamer which goes down to Para on Tuesday 27th January I shall forward the plants mentioned in my last I shall address them to the care of the Company's Agent (Snr Pimenta Bueno) at Para, to be forwarded to England by the first opportunity. I also forward a few ferns and other epiphytes in paper parcel. We came to this place a few days ago, but I have not been able to do much here as yet owing to rain. I fear the wet season has fairly commenced.

I am

Yours respectfully

James W. H. Trail

Dr. J.B. Hooker C.B.

My address is
James W. H. Trail
Care of the Agent of the
Amazon Steam Navigation Company
Belém
Grão Para
Brazil

The Heveae are not yet in fruit so I have not been able to get seeds as you wished yet but I hope to do so when the season for them arrives.

Letter No. 03

On board the "Beija flor"
Serpa
24th April 1874

Dear Sir

By the steamer which goes down river to Para tomorrow I shall send a barrel containing dried plants and other botanical specimens for the Kew Herbarium, which will I hope reach Kew in fair condition. As before I have addressed them to you. Among them are specimens of number of palms, chiefly of the genus Bactris, including leaves, stems, & spathes & spadices when I could get them but I have still some palmprints in spirit which there was not room to send in the barrel. The numbers on the labels attached to the palms refer to a catalogue of those which I have gathered in which I write out a description of each as I find it.

Since I wrote you we have been supplied with a steamlaunch in which we travel but it is very small so that I have very little room for making a good botanical collection. In addition to this our time is very fully occupied so that I find it necessary almost to restrict myself to collecting palms, or such plants as seem to me most curious, & this I trust will excuse the smallness of my collections. In Obydos I met a Brazilian botanist Dr Barbosa Rodriguez who is working out the palms and orchids of the Amazon valley, making paintings of each species. He believes he has found numerous new species of palms & some of those I had the opportunity of gathering when in his company & of having identified by him. I have put his names on labels with his initials B.R. on those which he has named.

Tomorrow we proceed to the Mauhes river and thence up the Madeira to San Antonio; we expect to reach Manaos, on our return from the Madeira, in about six weeks from this time.

The mosquitoes tonight are so troublesome that it is almost impossible to attend to what I am writing which must be my apology for this letter.

I am
Yours respectfully and sincerely

James W. H. Trail

Dr. Hooker C.B.

Letter No. 04

Manaos, Rio Negro
11th June 1874

Dr. Hooker C.B.

Dear Sir

I write in haste to inform you that I send to Para today a box of dried plants addressed to the Herbarium at Kew as with the two already sent. The plants are from the rivers Mauhes, Abacaxis, & Madeira. Among them are specimens of about a dozen species of small palms, *Bactris & Geonoma*, Spruce's "Palmae Amazonicae" is the only work on palms that I have with me except descriptions of species which I copied from Wallace's palms; but these latter I find to be practically useless.

Hardly any of those dried seem to be described by Spruce, save one or two of the *Geonoma* (& even these do not agree very well with those which they approach most nearly) but I do not think that I would be justified in naming them till I can compare them with the descriptions & figures of Martius.

In the box are also stems of all the palms whose leaves are the collections, & spathes & spadices, some dried, others in spirits. The numbers in the labels refer to a descriptive catalogue which I am making of each speceis as I collect it.

I am
Yours respectfully

James W. H. Trail

Letter No. 05

Manaos
15th July 1874

My dear Sir

I was much pleased to learn from your kind note that the first lot of plants to Kew arrived in good order, and that you were pleased with them especially as I despatched them in fear of their turning out comparatively useless, and also of their being spoilt on the way by mould as the rainy season had begun before they left Para. I hope the other two lots, one from Serpa in the end of April (in a barrel,) & the other from Manaos in the beginning of June (in a box) have reached you safely. They both contained specimens of a good many palms chiefly belonging to the genera *Bactris & Geonoma* some of which I think are previously undescribed, but I hesitate to describe them as such with the insufficient references at hand, & content myself with making out a description of each species as gathered to be wrought out on my return home.

By the steamer which leaves Manaos for Para tomorrow I forward another lot of dried plants, stems &c in a barrel. I collected them on the Rio Negro & on a branch of that river called the Padauiri, up which we steamed for a couple of days till we were a little way north of the Equator. I have added a good many new palms to my collection on both Rio Negro and Rio Padauiri some of them described by Spruce, & therefore in Kew Herbarium, but a good many of them not mentioned by him. On the Padauiri river especially I found several species undescribed by him especially an *Attalea* which bothers me a good deal. It has 6 exsert stamens & pendulous pinnae which drop much as in *Leopoldinia* major but the aspect of the palm, its spathes, spadices and fruit so much resemble *Attalea spectabilis* as to induce me to refer it without much hesitation to Attalea though it has also a hypogynous cup in the female flower which with the 6 exsert stamens would seem to make it out a *Maximiliana*. I should feel obliged for your opinion on the matter.

On the Padauiri river I have also found 2 species of *Desmoncus,* neither of them mentioned by Spruce though I do not know whether they belong to Martius species; you will see from the dried species that [ILLEGIBLE] reaching a lenght of only some 4 to 6 feet in all; it grows creaping among the grass and Melastomaceas, and is a very pretty little plant when growing, & very distinct [ILLEGIBLE]. The other species is well distinguished alike [ILLEGIBLE] from D. viparius, & from D. macrocanthus as you will see.

Of the genus Lepidocaryum I found on the Padauiri river what may be Spruce's L. quadripartitum, only the fruits are brick red. At about two miles distant on the other side of the river I found what I took from the leaves simply to be probably a variety of L. quadripartitum, but which from the fruit seems quite distinct, I find I must wait till I can compare my specimens with Spruce's in the Kew Herbarium. On the same river I saw the Piassaba palm *(L. piassaba)* in great abundance and in all stages of growth.

I have specimens in caxaça of the fruit inflorescence &c of all the palms in the Herb. [ILLEGIBLE] whenever I could get hold of them, & shall forward them as soon as I can make up a jarful, probably in a fortnight or thereabouts. Each specimen is wrapped in cloth & has a number tied up with it referring to the specimen in the Herb. [ILLEGIBLE] where locality & date are given.

I don't know very well when the work may be finished as there is some word of [ILLEGIBLE ...] indefinitely to the length of time of employment.

We seem now to be fairly through the wet season as fine weather has fairly set in with only occasional squalls.

I am
Yours respectfully & sincerely

James W. H. Trail

Dr. Oliver
Kew Herbarium

Letter No. 06

Manaos
24th August 1874

My Dear Sir

I send this to let you know that I am to send off another bundle of dried plants, palmstems &c by the steamer which leaves Manaos on the 25th Curt. I shall address them as previously to the care of Snr Bueno the Agent of the A.S.N.C° in Para, I have no doubt that they will be forwarded by him as soon as possible.

The bundle this time is rather smaller than usual owing to difficulty of moving about as our new steamer the Guajara is not ready for us yet, & the Beija flor has gone, so that we are at present prisioners in Manaos. Probably we shall be able to leave Manaos by the end of this month or the beginning of next month; as soon as we can we start for the Purus which we shall probably ascend for a distance of about 900 or 1000 miles; next we ascend the Solimoens to the mouth of the Jurua which we shall ascend also nearly 1000 miles; next we ascent (sic) the Solimoens as far as Tabatinga, & shall go a short distance up the river Javary. As far as we know at present this will require three or four months to complete, & then we shall return down river, stopping only a week or two at one or two places on the way.

When once we have left Manaos I shall probably not have any chance of sending anything home till our work is finished, so I think it better now to send home all that I can before leaving this port.

Among the dried plants are specimens of some 13 or 14 species of palms different from those already sent by me. They are chiefly from the woods near the Cachoeira da Taruma a waterfall some 8 or 9 miles from Manaos in a straight line, but a good deal farther

by river. In Spruce's "Palmae Amazonicae" I see he gives the forests of Taruma as the localities of some of his species; On comparing those that I have found in the same locality with his descriptions I find that I can identify about half of them, but the others are distinct from any of his species, but I suppose they have been described by Martius. Among them however is a Euterpe which does not seem to agree with any already described [ILLEGIBLE ...] it agree with E. coatinga in the pinnae being horizontal, drooping , or rather arching, only very slightly toward the apex. From E. coatinga it is distinguished at sight by the green leaf column, the more numerous (62-70 [ILLEGIBLE]) pinnae which are also narrower, & the more robust habit. I have preserved a specimen of the leaf column of each species.

I am constantly finding additions to my collections of species of Bactris, I think that I have now preserved specimens of over thirty species & I hope to add to them as well as to the other genera of palms on the little known rivers which we have still to ascend.

In the woods of Taruma I also found 3 additions to my collection of bulliferous plants; one of them seems to belong to Majeta, & another possibly to Microphysea.

Besides the dried plants & stems I this time also send a box containing two 1-gallon jars containing specimens in fluid. One of these contains only spadices with flowers or fruit of palms each done up in cloth with a label attached bearing a number referring to the number borne by the leaves, stems, & other dry specimens. Those in this jar are preserved in caxaça. The specimens in the other [ILLEGIBLE ...] they are not numbered but with this I send a list of what it contains. I shall be obliged if you will kindly give directions that whatever things are not desired to be retained for Kew should [ILLEGIBLE] be set aside for or sent to the Botanical Museum in Aberdeen University.

The jars are packed with palm leaves from Taruma. I did not require them as specimens so I thought they might serve as packing material & might possibly be of a little [ILLEGIBLE] on their arrival at Kew. Among them are leaves or portions thereof of *Mauritia carana* Wallace; *Euterpe*, coll. palm CIV; *Manicaria*, coll. Palm CX, *Geonoma aspidiifolia* Spruce.

I have still a few sections & others parts of palm trunks that I could not find room for in the boxes. I shall forward them with the next lot that I send. Would sections or other specimens of the following palms be of any use for the Kew collections? Mucaja, Inaja, Pupunha, Tucuma in fact any of the large species. I Shall be glad to secure specimens if of any service but I take it for granted that you already have them.

I remain
Yours most sincerely

James W. H. Trail

Letter No. 07

King's College
Old Aberdeen
8th Sept. 1875 (sic)*

My dear Sir

On my arrival in Liverpool yesterday I forward to Kew a tin trunk containing dried specimens from the Rio Jutahi, and a bundle of paper between two gridirons' containing some specimens collected by me near Para while waiting there for a passage to England. I hope the plants in both may arrive in fair condition.

I left in Para to be forwarded per S.S. Lisbonense 5 packages of botanical specimens, viz one barrel two boxes, and two canvas covered bundles of stems of the various palms sent home. In the barrel & in one of the boxes there are four (2 in each) 1-gallon jars containing spadices & fruits of the palms & also of various trees & shrubs bearing labels numbered in accordance with a catalogue referring to the dried plants. The Lisbonense is I believe expected to reach Liverpool in about three weeks from this time.

I do not know yet whether the Directors of the Amazon Company may require my attendance in London to put any questions to me personally, but in any case I should like to work over the palms collected by myself at Kew with the aid of the Herbarium specimens & published descriptions. I cannot make any scientific use of the collections made by me however unless the Directors consent to my doing so.

I should have answered the last letters in which you kindly sent me [ILLEGIBLE ...] but when the letter reached me I was on my way down river to Para thence to take steamer to England. I was very much interested by the curious facts in regard to the carnivorous habits of so many plants and the modifications of structure in each & I was much disappointed in not being able to examine the bladders of the S. American Utriculariae despite a close search for the plants near Manaos & near Para.

In regard to ant inhabited bullae I made some further observations near Para on Myrmedone &c, with the result of being about as much at a loss as ever as regards the formation of the bullae I could not make out any structure fitting them to serve as insect traps or as inducements to [ILLEGIBLE] to enter, & I am [ILLEGIBLE] that in most cases the ants resort to them simply for protection in the same way as solitary bees the nests of which I have occasionally found in bullae of other occupants I found at Para the larva (or pupa sometimes) of a Lepidopterous insect (Tortricidae?) & occasionally 3 or 4 small [ILLEGIBLE] Homoptera, usually tended by ants.

(*) This letter arrived in Kew at 17.IV 75. Trail made a mistake when dated the letter. He left Brazil for England in 11 March 1875, and arrived in Liverpool in 5th April 1875.

Appendix III - Continued

The ants colonies generally are commenced by a gravid female, but sometimes I have found three or four workers without a female. I shall probably hand over the ants to Mr F. Smith of the British Museum for his decision.

I remain
Yours most respectfully

James W. H. Trail

Letter No. 08

King's College Old Aberdeen
22nd April 1875

My dear Sir

In answer to your kind offer of assistance in obtaining the consent of the Directors of the A.S.N. Company to my undertaking the examination of the palms collected by me in Brazil I shall be very glad of such help if I find difficulty in gaining my request, & I do not doubt that at your recommendation they will agree to my doing so.

I shall probably go to London early next week, & shall take the first opportunity of visiting Kew.

In reference to my own prospects I intend at present to complete my course of medical studies to obtain a Medical degree at Aberdeen as I have already gone through the great part of the course, & require attendance for only six months longer.

Hoping that you are now in the enjoyment of good health.

I remain
Yours most respectfully & sincerely

James W. H. Traill

Letter No. 09

King's College
Old Aberdeen 8th May

My dear Sir

I am glad to hear that the specimens have at last all arrived as I was beginning to be a little afraid they might have gone missing.

I think they had better all be unpacked at the Museum though some of the smaller spathes & spadices may afterwards be suitable for laying down on the sheets in the herbarium. Perhaps it might be better to leave the specimens in the jars till I can be present though the spirit about them would [ILLEGIBLE] but if you think it better they may be taken out & on the chance of you preferring to have them done up as soon as possible I [ILLEGIBLE] a list with the number [ILLEGIBLE] names similar to those on the labels attached to the specimens. I am not sure on which jars the various specimens may be however.

The address of my employers.
The Directors of the
Amazon Steam Navigation Co.
105 Gresham House
Old Broad Street
London E.C.

I think the names of the directors at present are Viscount Maua, Viscount Gort, Sir F. Arthur. & Mr James. There is also a Brazilian whose name I do not remember. Admiral Osborne was a director when we were sent out & was I believe the one who was mainly [ILLEGIBLE] in making it a scientific expedition but he had sold out before our return.

Yours most sincerely

James W. H. Traill

Letter No. 10

King's College
Old Aberdeen
18th June 1875

My dear Sir

I have this morning forwarded by rail, addressed to you, a boxful of seeds of the Para rubber or Seringa tree (*Hevea Brasiliensis*?) which reached me yesterday afternoon. They were forwarded to me from Para by Snr Pimenta Bueno on the 17th ... & have thus been exactly a month on the way.

I have addressed them to you in case Dr Hooker should not be at home as I know the importance of having them planted as soon as possible. Perhaps it may be of use to mention that the trees drop their seeds either very shortly before or while the forest is flooded with the river water & that possibly the seeds require to be steeped for some time. I hope that a fair proportion of those sent may germinate.

Yours most sincerely

James W. H. Trail

Letter No. 11 - Sent to Dr. Hooker by the A.S.N.Company.

The Amazon Steam Navigation
Company Limited,
105 Gresham House, Old Broad Street
London, 24th June 1875
E.C.

Sir,

I am instructed by the Directors to acknowledge receipt of your favor of 11th inst and to say they are very pleased to learn that the specimens collected by Mr. Trail are of so much value and are so highly appreciated by yourself than whom no one is better qualified to judge.

I am, Sir

Your Obedient Servant

Francis Morton

Letter No. 12

King's College
Old Aberdeen
10th July 1875

My dear Sir

I yesterday received a letter from Prof Dyer, & today one from Dr Oliver informing me that a pamphlet had been sent to Kew Herbarium containing descriptions of new species of palms gathered by J. B. Rodriguez in the valley of the Amazon and asking if I could give any information as to the nature of his collections. I was a good deal surprised to hear that he had published descriptions in as much as he told me in Para the day before I left Brazil that he intended to come to Europe to compare his descriptions with the various type specimens & descriptions in works to which the could not get access in Brazil, & that he intended to defer publication until he could do so. In March of this year the only work on palms to which he had consulted were Martius work, & Kunths *"Enumeratio"* & with all later works he was entirely unacquainted & had never seen Spruce's Monograph till I gave him the copy I had with me.

He promised me a copy of his diagnoses of new species while I was in Para, & was to give it me there but deferred doing so till it was too late & I have not since heard ... from him. I think it probable that his haste to publish has been due greatly to a fear lest I should anticipate him especially as Prof. Dyer informs me that all his new species are initiated with

his own name. Of four species I gave him specimens at the same time gave him diagnoses of them & the names which I attached to them provisional on their proving to be new species, as I found they were on examining them at Kew. These are (the numbers refer to my collection)

Nº X *Bactris inermis*
Nº XX " *syagroides*
Nº XXI " *oligocarpa*
Nº XXII " *elegans*

If he claims these as species of his own it will show that he is not overscrupulous in his dealings & seeks to attach his name to species by any means. He seemed to me to be very much of a species splitter, & to strive to make out as many novelties as possible by hook or by crook, so that I fear his pamphlet will prove to add to the synonymy rather than to the species really deserving the name.

In the collection brought to Kew by me I gave to the species that I knew to be already named by him the names he had given. As he himself gave me the names they may be looked on as types. In my collection they are numbered as follows

Nº XI *Bactris setipinnata*
Nº XII " *turbinocarpa*
Nº XIII " *constantiae*
Nº XIV " *palustris* = *B. bidentula Spruce*
Nº XV " *trailiana*
Nº XVIII *Astrocaryum farinosum*
Nº CXIII *Cocos aequatorialis* = *Maximiliana inajai* Spruce

Probably I have several more of his new species (true or false) but these are all of which I can be positive, as I have not seen his pamphlet as yet.

You will be able to judge better than I can of his work, but under the cricumstances I should feel inclined to receive his new species with a good deal of reserve & to subject them to a close examination before admitting them to full confidence.

In conclusion I may add that I hope he may soon publish his paintings of Brazilian palms as they are really excellent.

I am sorry to hear that the India rubber tree seeds have turned out so ill; they are very difficult to bring home alive I fear even by the quickest route.

I have addressed this to you as Prof Dyer requested me to do so.

I remain
Yours most respectfully & sincerely

James W. H. Trail

P.S. I hope to return to Kew & to finish my work on the palms shortly.

Letter No. 13

Old Aberdeen
1st November 1876

My dear Sir

I was just on the point of writing you when your letter arrived to ask that a set of the Palms should be given to the Herbarium of the British Museum, and another (if you think right) to Edinburgh Herbarium, I should like the national collections in this country to have the firsts sets (after my own); the rest I leave entirely at your disposal for distribution as you think best. Dr Reichenbach has written to ask if he may have a set so I have ventured to refer him to your for a decision.

I should like to have the plants addressed to King's College, Old Aberdeen. The tinbox left by me had best be sent with them; its vegetable content may remain at Kew unless you would be kind enough to send the lichens to Dr Stirton, (4 Newton Street, Glasgow) as he has had the rest of the lichens through his hands.

I hope to spend some time in London during the winter.

Yours most sincerely

James W. H. Trail

Letter No. 14

Old Aberdeen
18th November 1876

My dear Sir

At present family circumstances do not, and will not , permit me to leave this country before the end of this winter, and as I cannot hope that the situation you have so kindly recommended will remain vacant till that time I compelled to relinquish all prospect of being able to accept it. I regret the state of the case much as the opportunities of extending my knowledge of South American Botany, in the field as well as the work in the Colonial Museum are most tempting to me. To yourself I feel another obligation added to the many acts of kindness that I have already experienced at your hands.

I remain
Yours most respectfully & sincerely

James W. H. Trail

Letter No. 15

Old Aberdeen
27th March 1877

Dear Dr Hooker

I write in haste to let you know that I have just heard that I have been appointed to the Professorship of Botany here. I regret very much not having been able to come to a conclusion [ILLEGIBLE] this about the appointment in Georgetown, but I was very doubtful about my chances of success in Aberdeen. I hope that I have not stood in the way of any one else fit for the position.

With many thanks for the uniform kindness that I have experienced at your hands.

believe me
Yours most respectfully & sincerely

James W. H. Trail

Letter No. 16

University of Aberdeen
29th November 1881

Dear Sir Joseph

I enclose with this a sketch of what seems to me the most nature arrangement of the Cocoineae so far as I am acquanted with them though with some reserve as the group are very difficult to define clearly. The genera that you retain are I believe the only ones of all as yet proposed that are worth retaining and even they are in one or two cases (which I shall specify below) rather artificial, especially under Eucocoineae, while in some cases it is almost impossible to get good characters for what I believe nevertheless to be good natural group. Among the palms it seems to me that the corolla of the female flower is hardly reliable, e.g. it separates closely allied genera such as Bactris & Martinezia, Astrocaryum & Acrocomia. [ILLEGIBLE] seem to me most [ILLEGIBLE] to the genera above mentioned than to the group represented by Cocos. In fact except in the petals & sepals of the female flower being nearly free there is hardly any character to separate Martinezia from Bactris, while Acrocomia seems very close to Astrocaryum. On the other hand perianth-characters fail to separate Bactris from Desmoncus on the one side and from Astrocaryum on the other, yet these groups are [ILLEGIBLE] of spadix & endocarp & other minor differences.

The position of the pores in the endocarp is a sufficiently constant character in the Cocoineae, and is I believe distinctive of natural subtribes. The genera allied to cocos seem very difficult to distinguish by sufficient characters.

Diplothemium seems hardly more than a subgenus of *Cocos*, holding the same relation to it that *Bactris concinna*, *B. bifida* and other species with simple spadix hold to *B. pallidispina* [ILLEGIBLE] others with branched spadix.

Maximiliana again differs from *cocos* in no way that I can see save in the minute petals and large exserted stamens.

Scheelea seems moderately distinct from these in having slender [ILLEGIBLE] petals and 3-chambered and seeded drupe but in the latter character comes near *Attalea* and *Orbignia*. Though usually the stamens are more numerous in these yet some species of *Attalea* have only 6 stamens.

Orbignia seems to differ from *Attalea* chiefly in the free twisted anther lobes, and possibly in the [ILLEGIBLE] flowers. I do not know *Jubaea* sufficiently to venture an opinion about it.

I am surprised that Wendland thinks that Cocoineae should be reduced to *Bactris*, *Elaeis* & *Cocos*, as I has thought he was inclined rather to the multiplication of genera. *Iriartea* & *Mauritia* he has broken up I believe to an unnatural extents.

Oenocarpus and Euterpa I think are well characterized if we look to the leaf sheath, to the spadix (like a horae tail in Oenocarpus [drawing], with rigid spreadint branches [drawing] in Euterpe) and to the fruit which is oval with the stigma apical or subapical in Oenocapus, globose with the stigma in the middle of one side in Euterpe. The genera are hardly separable by the flowers.

I shall probably be in London for a short time in the beginning of the year & shall take with me the Guiana palms that have been in my hads for some time, there all belong to described genera.

Euterpe caatinga, Wallace, is I think a true Euterpe despite the absence of fibres in its mesocarp; it is certainly & truly a wild plant, not having been cultivated in America at all to my knowledge.

Dr. Dickie is in his usual health never able for much exertion but [ILLEGIBLE] on at Algae.

Believe me
Yours very faithfully

James W.H. Trail