



*Biodiversity In The Patent System:
A country study of biodiversity, genetic resources
and global patent activity for Gabon*

Prepared for
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)
October 2013

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Introduction

This report presents the results of analysis of patent activity for genetic resources and traditional knowledge from Gabon. The report is divided into three sections:

Section 1 provides an overview of biodiversity in Gabon based on information from the Global Biodiversity Information Facility and introduces the patent data.

Section 2 provides a general overview of patent activity for species known to occur in Gabon in the period 1976-2010. This is followed by detailed analysis of patent documents that make reference to Gabon and data based on species that are limited to distribution in Gabon.

Section 3 provides a set of short summaries for species that are a focus of patent activity. This information will also be made available online for further research through the Access and Benefit Sharing Patent Index (ABSPAT).¹

The report was prepared using large scale text mining of patent data for species names and country names. This data was then combined with taxonomic information from the Global Biodiversity Information Facility. Additional patent research was conducted using the commercial Thomson Innovation database and processed using a variety of software tools.

Patents are an important indicator of investments in research and development directed to the development of commercial products. The aim of the report is to identify potential opportunities for economic development in support of conservation by identifying existing research and development involving species from Gabon. The research did not investigate the terms and conditions under which patent applicants obtained the genetic resources and traditional knowledge disclosed in the patent document. Therefore the report does not consider the problem of biopiracy or misappropriation of genetic resources and traditional knowledge.

The research was initially limited to searches of patent data from the United States, the European Patent Office and the international Patent Cooperation Treaty in the period 1976-2010. Additional research was performed to identify and review all patent documents making reference to Gabon published anywhere in the world between 1900 and 2013. As such the report provides a baseline for patent activity involving species from Gabon as a basis for further research.

Our research focused primarily on documents that make reference to Gabon and to cases where existing distribution data suggests Gabon is a likely source for the species. This imposes two limitations on the research. First, we focus on identifying species that are a focus of existing research and development. However, the report does not seek to provide the complete global patent landscape for an individual species. Second, because we focused on identifying species from a country we did not search patent data for references to regions (i.e. Africa) or sub-regions (i.e. Southern Africa) in the patent data. To address this issue we deliberately highlight cases where a species is distributed in more than one African country.

¹ ABSPAT is available at <http://www.abspat.net>

This report is one in a series of reports on patent activity for species from African countries. The following observations are based on the research for the fifteen African country reports to date and form the main recommendations arising from the research.

Taxonomic Research:

1. There is a need to improve the availability of taxonomic information for each country. In the absence of taxonomic information it is not possible to identify genetic resources that are relevant to a particular country in patent data and any relevant opportunities for economic development. African countries could consider giving greater priority to taxonomic research and making taxonomic information available through GBIF.
2. Georeferencing of the coordinates for the locations of species is an important standard in modern biodiversity research. Georeference data can be used to identify where species have been recorded in a country and also where biodiversity research has been concentrated. In our view georeferencing is an under-utilised tool for identifying where species are located as a basis for engaging with indigenous and local communities to consider potential development opportunities. We recommend greater attention to georeferencing and its use for engagement with relevant indigenous and local communities.
3. Taxonomic research does not attract investment because it appears to be remote from economic considerations. In practice taxonomic information is vital to identifying opportunities for development that is supportive of the objectives of the Convention on Biological Diversity and its Nagoya Protocol.
4. Taxonomic information is also important for the capacity of countries to monitor compliance with the Nagoya Protocol by improving baseline data on the species within a country. Advancing knowledge and understanding of biodiversity and the traditional knowledge of indigenous and local communities has an important role to play in long term monitoring under the Nagoya Protocol.

The Patent System:

1. Patent documents are frequently unclear on the precise origin or source of genetic resources and associated traditional knowledge. In addition very limited information is available on the terms and conditions of acquisition of genetic resources and traditional knowledge. This could be improved through enhanced disclosure of origin measures as advanced by the African Group and discussed in greater detail elsewhere.²
2. Species are commonly distributed in more than one country. It is important that African countries include requirements in access and benefit sharing agreements to clearly specify the source of genetic resources and associated traditional knowledge in any patent applications that may arise under the terms of an agreement. When combined with the enhanced disclosure measures noted above this would greatly improve capacity to monitor patent activity under the terms of the Nagoya Protocol.
3. One of the major issues that emerged in the research is the problem of essential incorporation of species into patent claims. Patent applicants frequently list very large numbers of species, or make reference to genera and families, with the purpose of incorporating all members of a genus or family into the scope of the patent claims. Typically these applications did not involve collection or use of many of the species that are listed. The aim of essential incorporation is to prevent others from using compounds, extracts or ingredients from these species in similar inventions or products. Where granted these patents are likely to have negative consequences for

² Oldham, P & Burton G (2010) *Defusing Disclosure in Patent Applications*. UNEP/CBD/COP/10/INF/44

researchers and producers in African countries seeking to develop and export similar products from these species. In our view, patent claims for components of organisms should be limited to the species from which the compound or extract was isolated by the applicants and not extend to members of the genus or entire families. Furthermore, in our view essential incorporation is anticompetitive and action should be considered to stop or severely restrict this practice.

4. In some cases patent activity may involve species that are vulnerable, endangered or CITES listed. In considering the possibilities for economic development identified in patent data it is also important to identify and assess the conservation status of the species concerned in order to support the objectives of the Convention on Biological Diversity.

Patents have frequently been viewed with suspicion within the biodiversity policy community as examples of the inequitable exploitation of resources from biodiversity rich developing countries. Our research demonstrates that patent data can also be turned to positive purposes to identify potential opportunities for economic development in Africa. We hope that this information will prove to be useful to African countries.

Gabon

Area:

267,667 sq. km.

Coastline:

885 km.

Climate:

Tropical; always hot, humid.

Geography:

Narrow coastal plain; hilly interior; savanna in east and south. Most of the country is covered with forest.



Biodiversity in Gabon and Patent Activity:

Data for biological diversity was obtained from the Global Biodiversity Information Facility (GBIF). GBIF is an international government-initiated resource that provides open access to the most comprehensive quantitative data of species across time and space presently available. All data is submitted by participating collections who share biodiversity information.

Using this resource we have obtained biodiversity records for species which occur in Gabon. It should be noted that the usefulness of this data in determining the actual distribution of a given species is conditional to the comprehensiveness of the data submitted by GBIF participants. Therefore we would stress that the absence of records should not be interpreted as indicating an absence of a given species, and similarly that a recorded species that only appears from one country should not be regarded as evidence of endemism. All reasonable efforts in identifying endemic species were made from alternative sources during the compilation of this report.

GBIF presently records 8,588 species for Gabon with 157,484 georeferenced coordinates for the occurrences of these species in Gabon.

We identified a total of 78,007 documents containing species known to be distributed in Gabon. Of these 95 made some form of reference to Gabon. These documents were manually reviewed in MAXQDA software to identify documents specifying a source or origin in Gabon.

The 95 documents that made a specific reference to Gabon contained 14 species. These documents were manually reviewed in MAXQDA data analysis software and through this process we were able to identify species where it was definitively stated that they had been collected, sampled or otherwise obtained from Gabon.

In addition, using GBIF distribution data we identified nine species where GBIF presently records distribution only in Gabon. These species appeared in 16 patent documents where Gabon was not explicitly mentioned. The idea behind this was to identify cases where a species (based on available distribution data) was likely to have come from Gabon and thus be regarded as a species of likely or potential significance for Gabon. For the sake of simplicity we call this data 'Distribution 1'. These documents were then selected for further review.

Finally, we carried out an additional search across all global patent jurisdictions for any documents featuring the country name Gabon published between 1900 and 2013. This search identified 1,808 raw documents with 67 documents containing species references which were manually reviewed using MAXQDA software. This search was undertaken to ensure that as much up-to-date data as is available was incorporated into the results. For the sake of simplicity we call this data 'Global 2013'.

Biodiversity and Distribution

Much of the data submitted to GBIF includes geographical coordinates indicating where the recorded species was located. A total of 157,484 coordinates were available for Gabon. Using this data we are able to show the physical distribution across Gabon of all GBIF recorded species. Plate 1 shows two maps: The upper map shows plotted points, each indicating a GBIF record. The points are coloured to indicate the kingdom to which the species belongs. It should be noted that this geographical information is raw data as submitted to GBIF by participating recorders. It has not been cleaned to remove any human errors when inputting to the GBIF database (an example of such an error might be where a longitudinal coordinate has been recorded as a + rather than a -). The lower map shows major settlements and road. It also includes the location of some protected areas, including 13 National Parks such as Wonga Wongue National Park to the west and Minkébé National Park in the north - places expected to be of significance for biodiversity. A larger version of the distribution map can be found in the appendix of this country report.

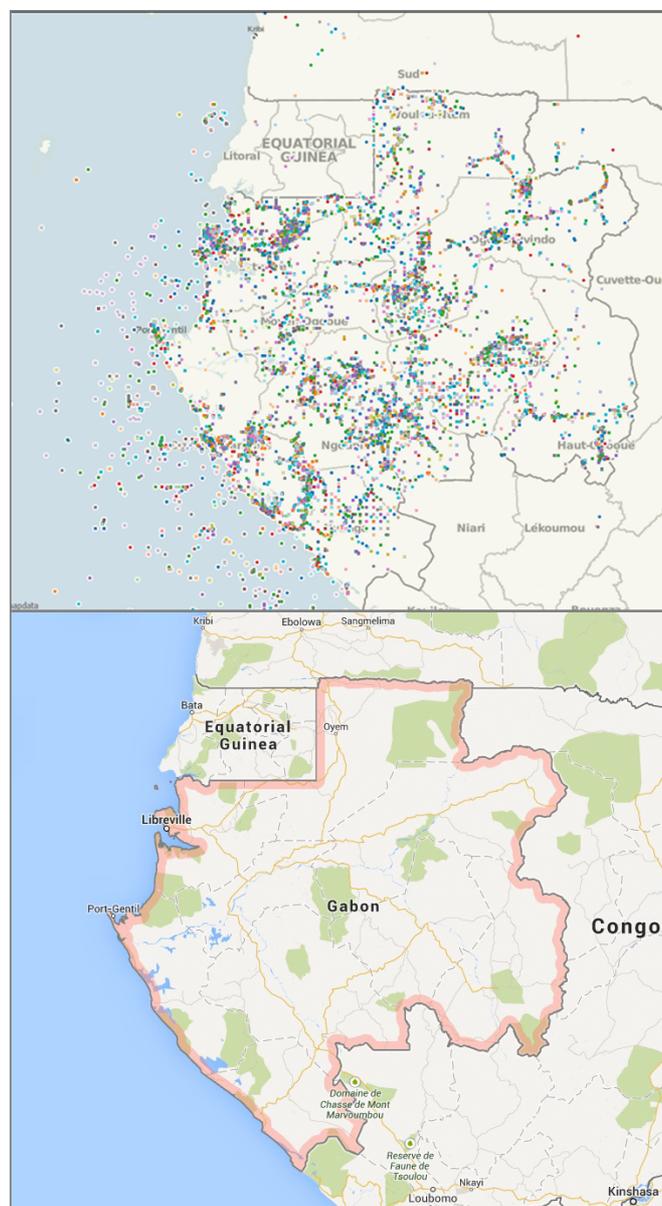


Plate 1: Distribution of GBIF records from Gabon (upper) and major settlements and roads (lower) (map courtesy of Google Maps). Each colour point represents a species record coloured by kingdom.

It is interesting to note when comparing the two maps that there are large areas of the country showing extensive recording. Road networks show up clearly, with the north and east where the roads are fewer being the least well recorded. The National Parks stand out as hotspots as does the coastal region close to the capital, Libreville. We would note that georeferencing of species data has an important role to play in facilitating the identification of where species are located in a country. While caution is required in the case of endangered species we would emphasise the wider importance of promoting georeferencing in enhancing knowledge and understanding of biodiversity in Gabon.

GBIF presently records 9,597 species known to be present in Gabon (this figure includes unresolved names, hence the increase in species from the number quoted above). This list is dominated by plants and animals which account for 9,214 species. The remaining records are dominated by fungi and protozoa, but six kingdoms in total are represented. This suggests that a varied range of recording and collection has been undertaken and the relatively large amount of georeferenced data shows that the biodiversity in this country has been recorded more thoroughly than many other African nations.

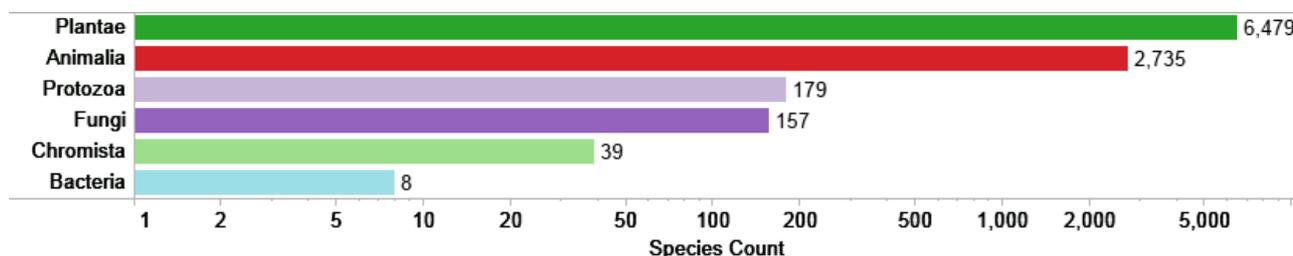


Table 1: Showing the number of species in Gabon by kingdom using GBIF data.

Using global data it is possible to examine the wider distribution of Gabonese species. Plate 2 shows where records exist across the globe for such species. Species that are found in two or more countries are referred to as 'cosmopolitan'. Each pie represents the number of species that are found in Gabon in a particular kingdom. It can be seen that a substantial number of species have a very wide regional distribution throughout sub-Saharan Africa and particularly within the countries on the south coast of Western Africa and those of a similar latitude. A small number also have global distributions, although it should be noted that some of these records may originate from research institutions or collections and therefore do not represent native or naturalised distribution.

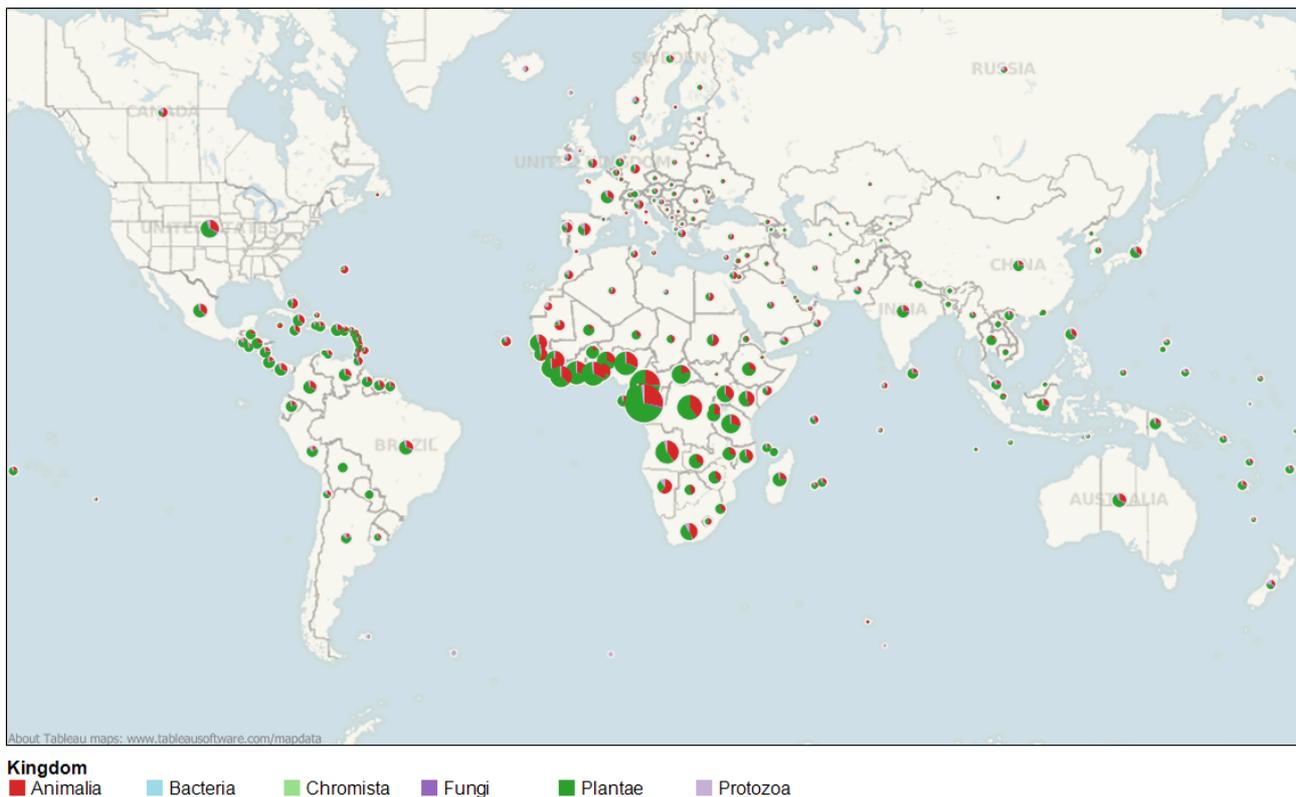


Plate 2: Global distribution of Gabonese species shown by Kingdom and the number of species recorded in GBIF.

Biodiversity in Gabon in the Patent System

As of 2013 a total of 1,268 patent documents in the main patent jurisdictions (European Patent Office, the United States, and the Patent Cooperation Treaty) specifically mention Gabon. This provides a general overview of references to Gabon in the patent system across all areas of invention. Only a proportion of these documents will also refer to species collected in, or sourced from, Gabon. In addition, patent applicants will make reference to species that originate from Gabon but will not mention Gabon as the source of genetic resources or traditional knowledge.

Our aim in this section is to provide a brief overview of patent activity for genetic resources of relevance to Gabon. We focus on patent activity in the main patent jurisdictions in the period between 1976 and 2010. We then examine the results of research to identify genetic resources and traditional knowledge that originate from Gabon. In approaching patent activity for genetic resources from Gabon we focus on three categories of data.

1. Species that are known to be distributed in Gabon but are also distributed elsewhere in the world. This provides an overview of global patent activity for genetic resources of relevance to Gabon.
2. Species where a direct reference is made to the collection or origin of a species from Gabon. This data is based on a review of patents that make reference to a species known to be distributed in the country and the country name.

3. Species where available distribution data suggests that a sample is likely to have originated from Gabon. This data is known as Distribution data and refers to cases where GBIF presently only records a species as occurring in Gabon and no other country. Because taxonomic information is incomplete, this data provides a clue rather than proof that a species originated from Gabon.

We begin our analysis with an overview of biodiversity that is known to occur in Gabon in the patent system and then turn to data on species originating from Gabon.

Gabon shares a significant proportion of its known biodiversity with other countries in Africa and around the world. Plate 3 provides an overview of patent activity for species that are known to occur in Gabon and other countries around the world. This overview provides information on trends in applications and grants, the top species appearing in patents that are known to occur in Gabon, top applicants or assignees and technology areas.

In total we identified approximately 1,380 species names in patent data from the major jurisdictions that are known to occur in Gabon. When model organisms including crops such as *Zea mays* (maize) and *Homo sapiens* are excluded this falls to 1,373 species names and 1,059 accepted scientific names.³ This data is relevant for Gabon because it demonstrates that researchers and companies are conducting research and development on species that are known to occur in Gabon. As Plate 3 makes clear, research and development is taking place across a range of technology sectors and is targeted to a variety of markets.

³ The 1059 figure excludes common model organisms such as *E. coli*, *Arabidopsis thaliana*, *Bacillus subtilis* and *Zea mays* (maize) that are globally distributed and are used as research tools in biotechnology. These species appear prominently in patent data for all almost countries and are therefore excluded.

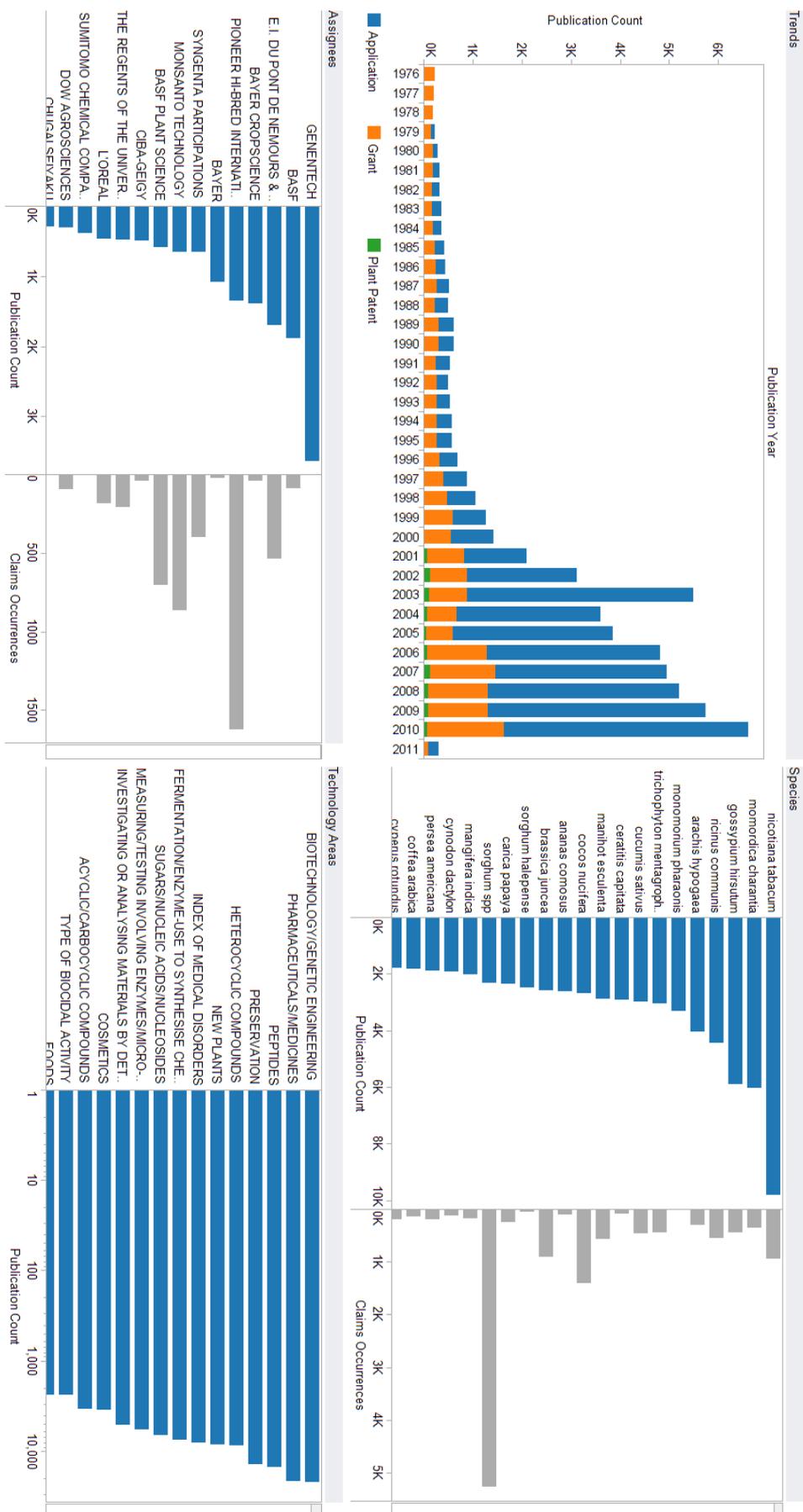


Plate 3: Overview of patent activity featuring species occurring in Gabon.

In total we identified 779 plant names in global data of relevance to Gabon with crops represented by species including peanut (*Arachis hypogaea*), cassava (*Manihot esculenta*), mustard (*Brassica juncea*), cereals (*Sorghum spp*), cotton (*Gossypium hirsutum*) castor oil plant (*Ricinus communis*), pineapple (*Ananas comosus*), avocado (*Persea americana*), cucumber (*Cucumis sativus*), coconut (*Cocos nucifera*), papaya (*Carica papaya*), mango (*Mangifera indica*), coffee (*Coffea arabica*) and tobacco (*Nicotiana tabacum*). Other species include the bitter lemon (*Momordica charantia*) which is grown as a food crop and has pharmaceutical uses. The grass species *Cynodon dactylon* is widely cultivated across tropical regions of the world. Insects are represented by *Ceratitis capitata*, a fruit fly which causes major destruction to crops, and the Pharaoh ant (*Monomorium pharaonis*). Fungi include the infectious *Trichophyton mentagrophytes*.

The assignees in the overall data for species of relevance to Gabon range across a spectrum from biotechnology (e.g. Genentech Dow); companies such as BASF and Bayer in areas such as biocides/insecticides and agriculture (e.g. Du Pont and Pioneer Hi-Bred International). More detailed analysis of technology areas revealed pharmaceutical companies such as Ciba Geigy. Also, companies which develop new crops such as Syngenta and Monsanto feature prominently, as does Sumitomo Chemical, which has interests in pharmaceuticals and crop science. L'Oreal represents the cosmetics industry. As this makes clear, there are a wide range of general and specialised technology areas and markets of relevance to biodiversity from Gabon. To gain a more focused view of activity we now turn to the results of research to identify organisms appearing in patents that were directly collected in Gabon or where distribution data suggests that Gabon is the likely source.

Species from Gabon in Patent Data:

In total we identified fourteen species of organisms that were directly sourced from, or potentially originate from, Gabon based on distribution data. Plate 4 displays these species based on a manual review of patent documents. In the next section a summary is provided for each species. This data will also be made available online to allow for further exploration of each case.

Plate 4 reveals that based on detailed analysis of patent documents, fourteen species appear in the data compared with the overview provided in Plate 3. The top species is *Tabernanthe iboga*, a shrub known for the hallucinogenic properties of the bark when chewed. Research into using extracts for the treatment of Hepatitis is carried out by a number of assignees including The Addiction Research Institute (WO2008039179A1) and other work involves treatments for addiction as seen in US6211360B1 by Albany Medical College. *Brazzeia soyauxii* is a flowering plant species belonging to the family Lecythidaceae. Sequoia Sciences Inc (US2010004480A1) and others have researched into a product to inhibit biofilms using compounds derived from this species. *Diospyros dendo*, an African timber tree is likewise used in this invention. *Pentadiplandra brazzeana*, a recently discovered plant is the source of a protein sweetener as seen in WO1994019467A1 by Wisconsin Alumni Research Institute. *Aucoumea klaineana* is another timber tree, from which gaboon resin is extracted. Parfum Christian Dior (US2002006416A1) use this extract for a cosmetic product for skin and hair.

Other species of interest are *Beilschmiedia fulva*, a rainforest tree from which compounds are derived for the treatment of allergies (US2004138313A1 Aventis Pharma GMBH). *Buchholzia coriacea* (also known as *Buchholzia macrophylla*) is a tree from which compositions for extracts used in cosmetics and pharmaceuticals have been claimed

(WO2005089705A1 Cognis France SAS) and also extracts are used in a composition for stimulating the immune system (FR2858935A1 Pierre Pyebi Oyoubi). *Garcinia punctata* is a cosmopolitan flowering plant and the source of extracts used against bacterial infectious diseases (US2004082662A1 Aventis Pharma GMBH). *Harungana madagascariensis* and *Vismia guineensis* are widespread species. Shaman Pharmaceuticals Inc of the USA (US5837255A and WO1998025639A1) claim a method for reducing blood glucose by administering harunganin or visimin. *Paspalum conjugatum* is a grass species from which anti bacterial and anti viral compounds have been extracted (WO2005021019A1 Aventis Pharma GMBH).

The only animal in the list of species is *Cercocebus torquatus*, a species of mangabey. Sequencing of the complete genome of a simian immunodeficiency virus acquired from a Gabonese specimen has been carried out by UAB Research Foundation (US2003162170A1). We include this example as a species of interest as it illustrates how a species from Gabon can be the carrier, and thereby the source, of genetic materials without it being the focus of the invention.

Finally, *Allanblackia gabonensis* is a flowering plant from which xanthone derivatives are extracted to use as anti cancer treatments (US20110263694A1 Museum National D’Histoire Naturelle & Institut National De La Sante Et De La Recherche Medicale). This species is included as a species of interest in Gabon due to its use in traditional medicine.

It can be seen from these descriptions that the genetic resources from Gabon are dominated by plant species and used for pharmaceuticals and cosmetics. This will be further discussed in the next section.

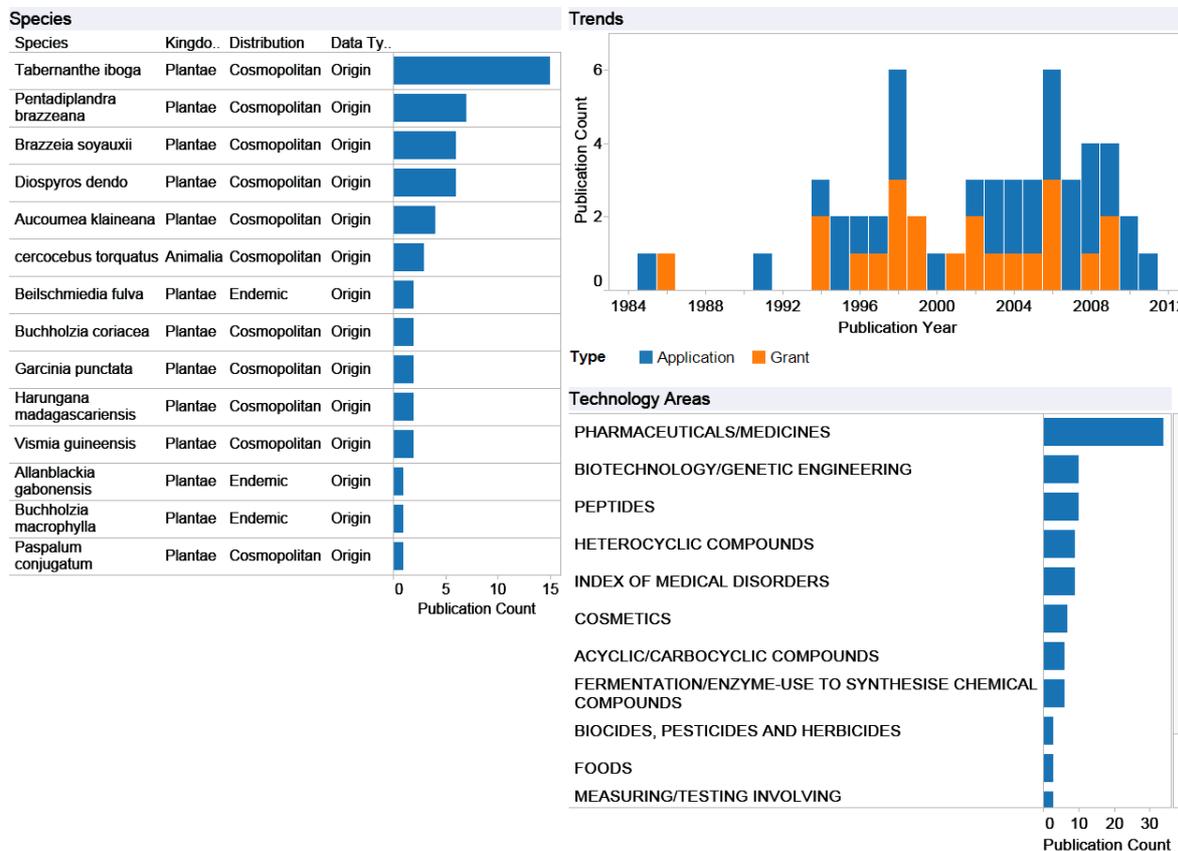


Plate 4: Species potentially sourced from Gabon.

Full details of the species identified in the research are provided in the final section of this report. In the case of Harungana it should be noted that references to traditional knowledge included additional African countries. Therefore this example will also be found in the associated reports focusing on those countries. This detail highlights how cosmopolitan species such as Harungana and other such as *Allanblackia gabonensis*, that are native to several African countries, may hold significant potential for collaboration in economic development and conservation.

Gabon has a limited portfolio of species that appear in patents. It is important to emphasise that species may be involved in research and development in different areas of science and technology and may serve different markets. In some cases a species may be the target of a particular invention. In other cases a patent may suggest potential uses of a particular organism while in others the species will be the direct focus of the claimed invention. We now turn to more detailed analysis of the technology areas involving species relevant to Gabon.

Technology Areas:

Table 2 provides a brief summary of the technology areas involved in patent activity for Gabon and is followed by a more detailed breakdown of activity.

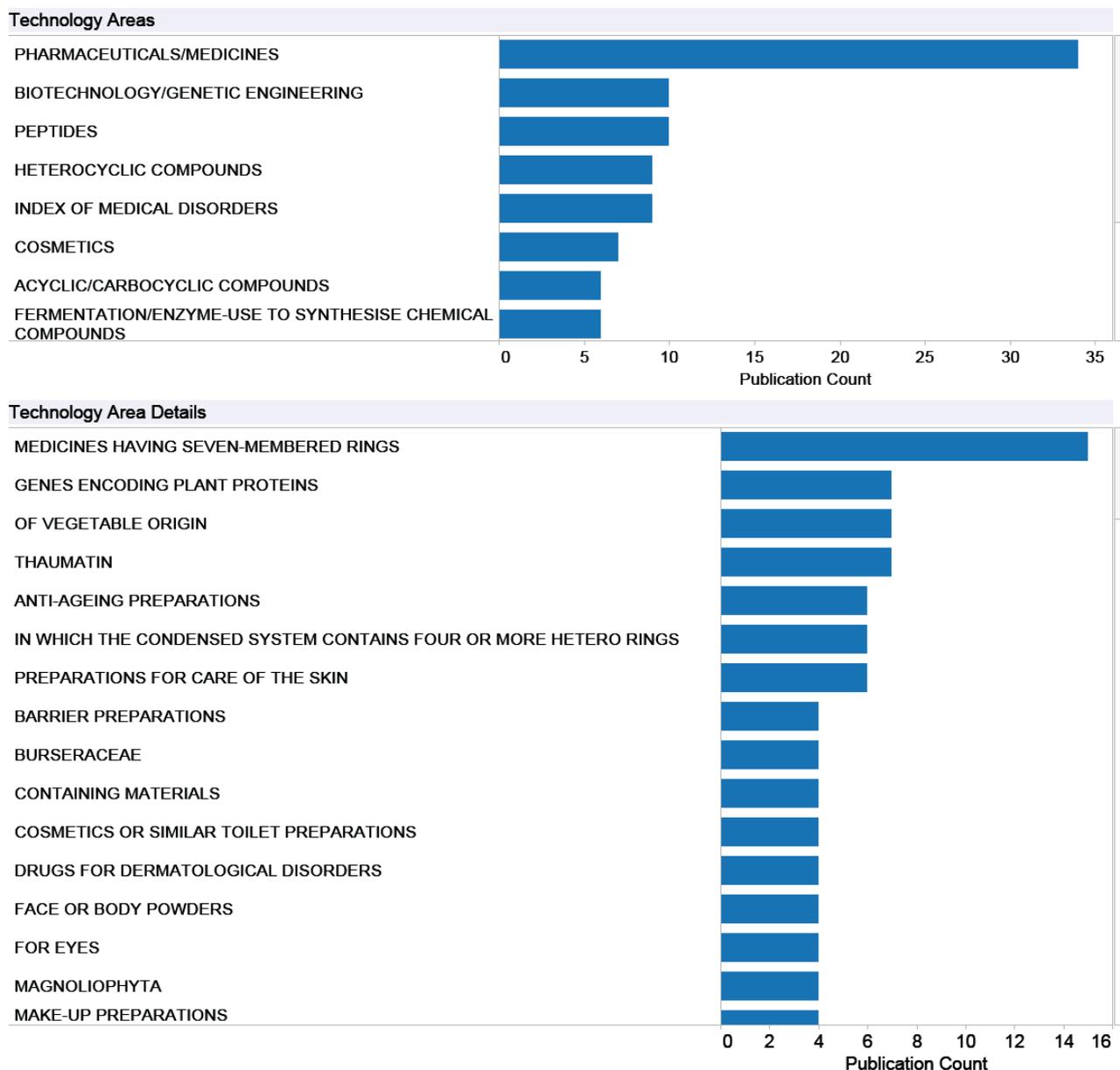


Table 2: Technology Areas.

The general overview of technology areas provided in Plate 3 emphasises pharmaceuticals, biotechnology and genetic engineering as well as cosmetics. The narrower dataset that focuses on species from, or likely to originate from, Gabon repeats this pattern.

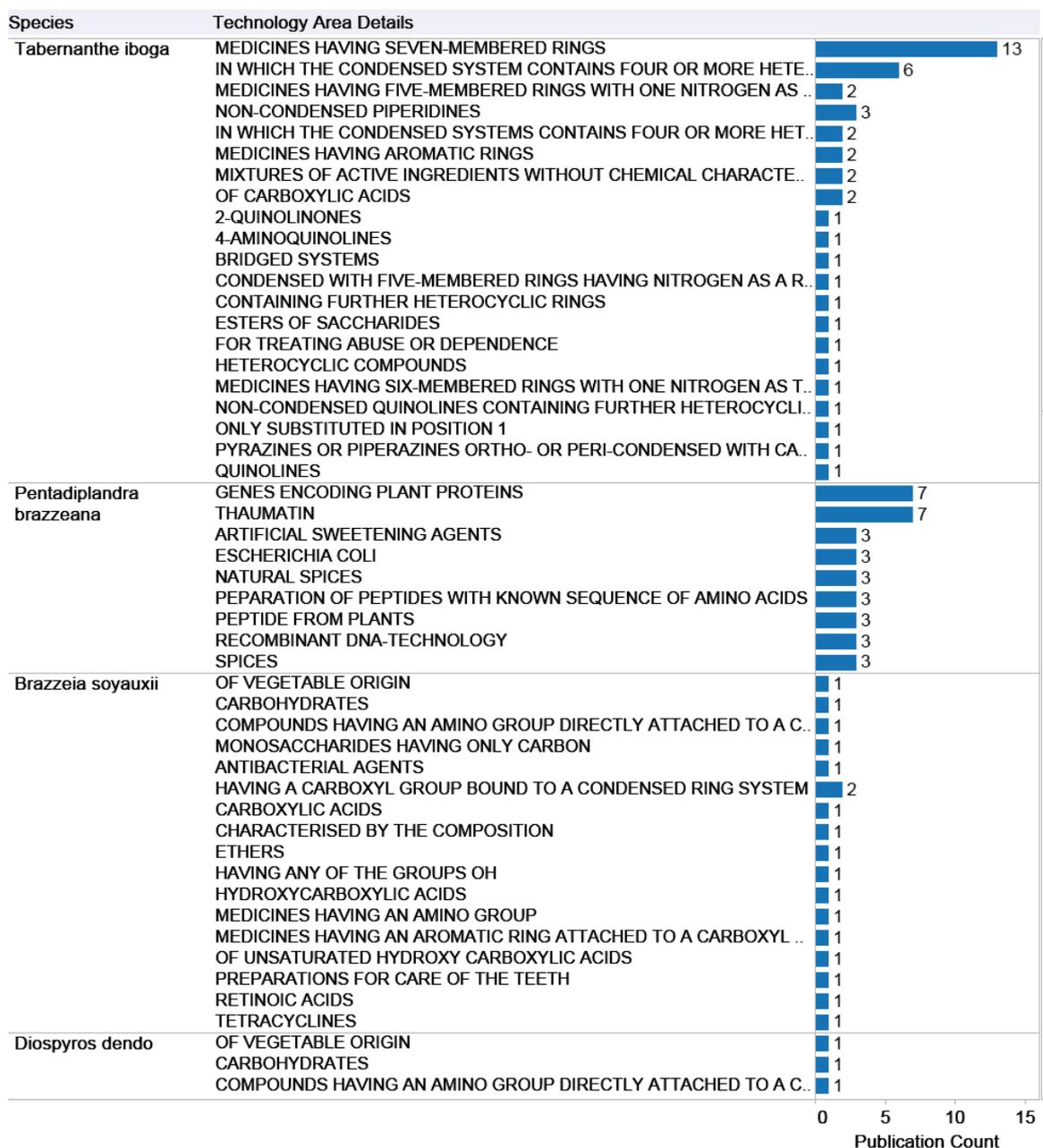


Table 3: Species and Technology Areas

Table 3 usefully reveals the range of potential applications and technology areas where a species and its components may be deployed. As such, a species may be a focus of activity for a range of different products and markets. However, in the case of threatened species there will be a need for careful stewardship and conservation of target species.

It can be seen, for example, that *Tabernanthe iboga*, which falls into the general technology area of pharmaceuticals and medicines, is heavily focused on biochemical properties when seen at a more detailed level.

Patent Claims:

Additional insights can be provided by examining the types of claims that are being made in relation to the species. A patent application may contain multiple claims but is required to contain only one invention. The first claim sets out the major focus of the claimed invention and frames all other claims.

Patents are awarded for three main classes of invention:

- a) Compositions of matter
- b) Methods or processes
- c) Machines

In some jurisdictions claims may be permitted for new plant varieties either under standard patent legislation or under specific legislation (e.g. US Plant Patents).

Table 4 displays a summary of the top terms appearing in patent claims relating to genetic resources for Gabon. As can be seen from this list, method, compound and composition all feature prominently, along with more specific terms relating to individual inventions, as would be expected with such a small statistical sample).

The first major category of patent claim is for compositions of matter (compositions). For example, *Buchholzia coriacea* is used in an invention which claims a “A cosmetic or dermo-pharmaceutical composition including an extract of a plant belonging to the genus *Buchholzia* and at least one auxiliary and/or additive is provided.” (US2007178059A1). Compositions are commonly extracts, compounds or combinations of ingredients (e.g. in pharmaceuticals or cosmetics and herbal medicines). Patent claims for compositions typically include a list of the compounds or ingredients that are the subject matter for protection. It is useful to note in this example that this claim for a composition is the first claim, yet later in the same application Claim 10 reveals that the applicant is also claiming “a method for the cosmetic treatment of the skin or scalp and a method for the treatment of skin inflammation includes administering to a patient in need thereof a composition including an effective amount of a plant extract from a plant belonging to the genus *Buchholzia*”. Although the primary claim is for a composition the scope of the claim goes further and includes a method for the use of the composition. This is a common occurrence in claims.

Claims are also frequently broadly constructed such that the use of compounds from the species, the genus, and in some cases the family, are incorporated into the scope of the claims. While composition of matter claims may be constructed in various ways, broad claims may well impinge upon the ability of producers from a country to export products containing the claimed components into markets where a patent is in force.

The next category of patent claims is for methods, such as methods of producing a compound or treatment which leads to a desired outcome. Method claims are frequently more restrictive in their coverage of genetic resources because the genetic component is only claimed in so far that it is relevant to performing the method. That is, it is the method that is the focus of the invention. Therefore it is the method, and the use of the claimed genetic or biological component in performing that method, that is the subject matter of protection. An example of this is the use of *Allanblackia gabonensis*. In this case the species is used in a “method of preventing and treating chronic leukemias chosen from B-cells chronic lymphoid leukemia (B-CLL) or B-lymphoma, the method comprising

administering to a patient in need thereof an effective amount of a xanthone derivative” (US20110263694A1). Clearly, although the xanthone derivatives are derived from the plant, in this case the claim is for a method or process in which the species is utilised. Therefore it is the method, and the use of the claimed genetic or biological component in performing that method, that is the subject matter of protection.

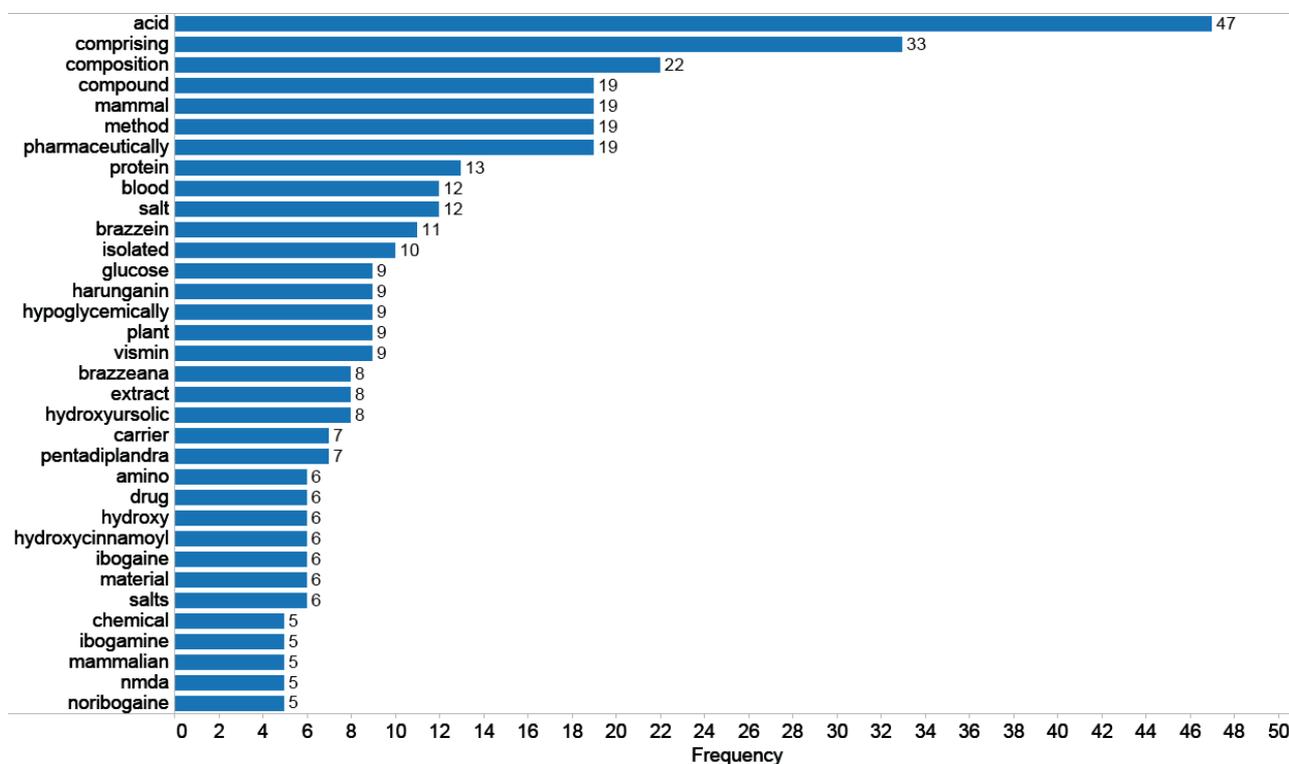


Table 4: Terms Appearing in the First Claims of Patent Documents.

As this brief discussion of patent claims suggests it is important to pay close attention to both the type and the content of patent claims. In addition, it is important to establish whether a patent has been granted, the jurisdictions where a patent has been granted, and whether it is in force. This type of analysis is particularly important when considering the potential development of products for markets. However, detailed patent analysis such as freedom to operate, patent validity, patentability, patent infringement and patent landscape analysis requires specialist analysis beyond the scope of the present report. Given the increasing importance of these issues for economic development, the World Intellectual Property Organization has established a Patent Landscaping initiative under its development agenda that commissions specialist patent research at the request of member states.⁴

Global Impacts and Global Markets:

We have seen above that a number of species are involved in patent activity of relevance to Gabon. However, it is important to note that many patent applications simply go nowhere. They may embody the hopes and ambitions of individuals, researchers, universities and companies but do not ultimately have an impact either in the patent

⁴ http://www.wipo.int/patentscope/en/programs/patent_landscapes/

system or in the market. A means for identifying important patents is therefore needed. Here we discuss two measures: a) patent citations, and; b) patent families.

Table 5 displays the citation scores by species and assignee for species relevant to Gabon. When a patent is filed and published it becomes prior art. Later patent applications that make claims for the same invention will find that the scope of what they claim as new, involving an inventive step, and useful, will be limited by these earlier claims. This is recorded in the patent system as a citation. The more often that a patent is cited by later patent applications is a measure of the importance and impact of that patent within the patent system. In some cases a single patent application may attract over a thousand citations (e.g. *Thermus aquaticus* in biotechnology). Patent citation counts are therefore an important measure of the importance of patent activity because these scores reveal the impact of patent activity on other applicants.

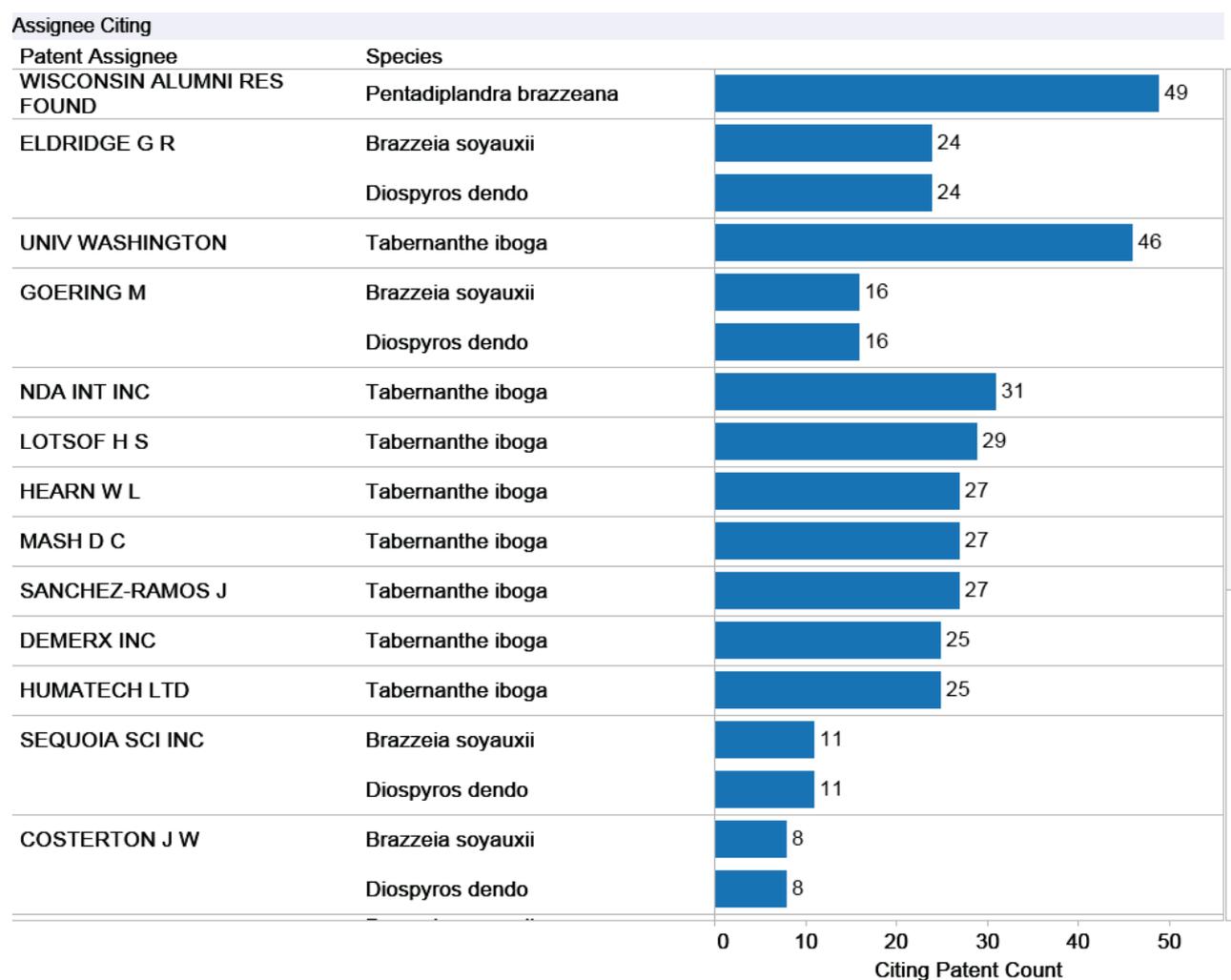


Table 5: Species and Assignee Citing Patents.

In the case of Gabon, Table 5 reveals a selection of citation scores for species of relevance to the country organised by species and assignee.⁵ Wisconsin Alumni Research Foundation has been cited 49 times for their work involving involving *Pentadiplandra brazzeana* for the “isolation of a sweet protein from the plant” (US5741537A1 and six

⁵ Table 5 aggregates the patent scores by species and assignee. If an assignee has four documents with citations involving the species, the numbers are aggregated to arrive at the total.

others). What this number of citations suggest is that there is great interest in finding alternative sweeteners to replace and supplement sugar and other artificial sweeteners in the food industry. The same documents also relate to the “sequencing of (the) protein and the creation of a DNA sequence capable of producing the protein artificially.”. It is therefore apparent that the economic potential of this invention is further reaching than the extracted protein itself, and the number of citations also reflects this.

Another example of a species which has multiple citations is *Tabernanthe iboga*. This species has been used by a number of applicants for a variety of uses of the extract Ibogaine. Washington University has 21 citations for work carried out on Alzheimer’s disease and neuropathic pain (US5958919A), while Howard Lotsof has undertaken work with the Addiction Research Institute on the use of ibogaine to treat hepatitis (WO2008039179A1) and additionally to treat addiction (US2006229293A1), as has NDA International Inc (WO1991018609A1). This spread of research and applicants and the high number of citations for the various arts, clearly shows that ibogaine is an important alkaloid in a number of technical fields. This gives the species a high profile in the patent data of genetic resources from Gabon.

A second measure of the importance of patents is provided by the size of patent families. Table 6 shows the numbers of patent family members. A patent family is simply a set of patent documents that link back to an original parent filing (known as a “priority” filing). These patent documents can be filed anywhere in the world and can be tracked using unique identifiers known as INPADOC numbers that link back to the parent document.⁶ In contrast with patent citations that provide an indicator of the impact of a patent on other applications in the patent system, the size of a patent family reveals how important a patent is to applicants. The reason for this is that they must pay fees each time they file a patent application that is linked to the parent (priority) application.

Patent family data of this type is useful in revealing the applicants who are most vigorously pursuing patent protection involving a species, or as is frequently the case, a group of species around the world. Aventis Pharma Deutschland GMBH provides an interesting example: For 4 publications feature the species *Beilschmiedia fulva* and *Garcinia punctata* in treatments for allergic disorders and infectious diseases (US2004138313A1, US7019028B2, US2004082662A1 & US6956061B2). The family size is 60 which reveals significant importance to Aventis Pharma. When compared to the previous table showing citing patent count we can see that there have been no citations for these 4 documents. This highlights how these two approaches of analysis reveal different aspects of patent activity. The family size suggests a potentially important use of genetic resources, yet the citation count shows that this research has not been taken up by others. On the other hand is Wisconsin Alumni Research Foundation, whose work developing sweeteners from *Pentadiplandra brazzeana* is seen to have been cited by 49 documents from a family size of 7 - a more modest family size (i.e. less global protection) but also a significant amount of interest from others.

⁶ INPADOC stands for the International Patent Documentation Centre which established the system. INPADOC is now part of the European Patent Office.

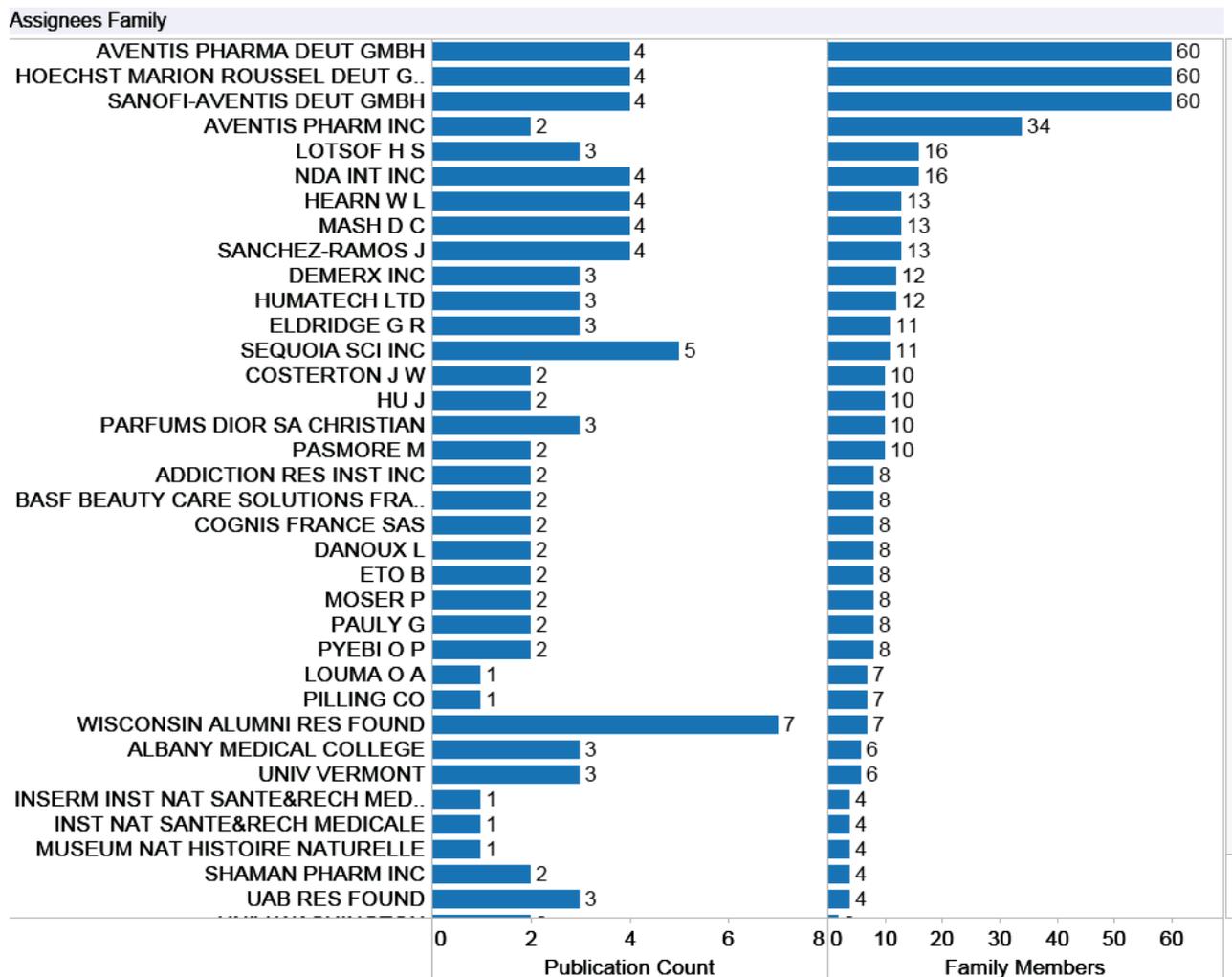


Table 6: Patent Assignees and Patent Families.

As this makes clear, while care is required in analysing why a particular species is referenced in a patent document, it is possible to trace the economic importance of particular patents to patent applicants using patent family data.

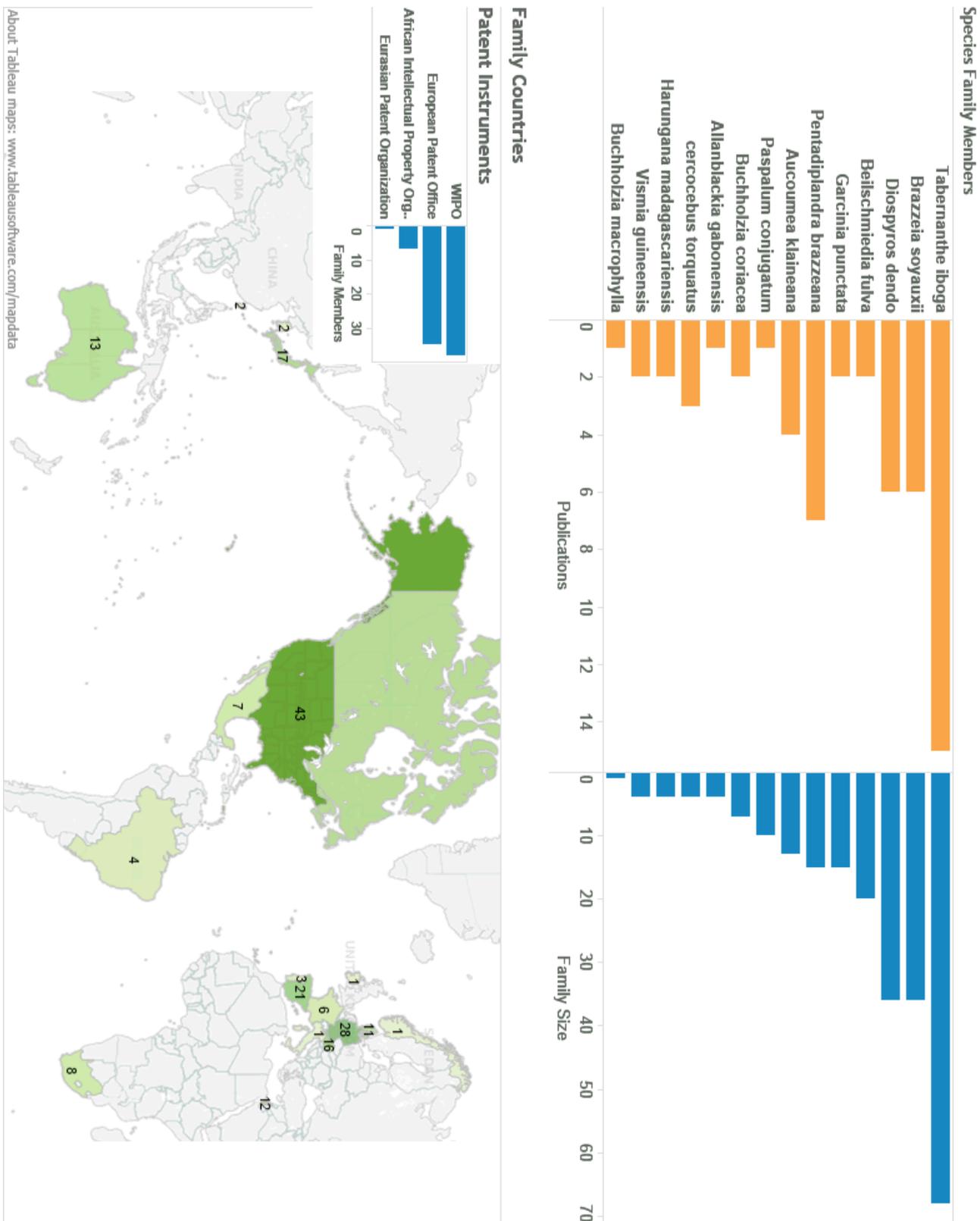
This type of analysis can be extended to the species level to consider the global impacts of patent activity and the position of patents involving a species in global markets.

Plate 5 displays patent family data by species and a global map of countries where family members linked to the species have been recorded. Please note that the map does not display the geographical locations for regional and international patent offices. Plate 5 is useful because it reveals what might be called the global reach or careers of species. We can immediately see the prominence of *Tabernanthe iboga*, *Brazzeia soyauxii* and *Diospyros dendo* in this data.

Analysis of this type is also useful because it exposes the markets where protection is being sought as provided in the Family Countries map. As we might expect the United States is a primary market with other major industrial countries such as Germany, Spain, Japan and Australia. With the dominance of pharmaceuticals technology in relation to Gabonese species this not surprising, and it is also reflected by the available data suggesting that patent applicants are not pursuing protection in African countries other than South Africa. This suggests that opportunities may exist within internal markets in Africa where patent protection is unlikely to prove to be a barrier. At the same time, patent

data also suggests countries where markets may exist for products involving biodiversity from Gabon.

Plate 5: Global distribution of family members.



Concluding Remarks:

The research into biodiversity and patent activity featuring species originating from Gabon has revealed that Gabon has relatively well recorded biodiversity when compared to other central African countries. This may reflect the stability which Gabon has enjoyed in recent times and the commitment to conservation that the government has made, enabling researchers to make more thorough studies of natural resources.

This level of biodiversity recording seems to correlate with a greater number of species of relevance to Gabon being identified within patent documents when compared to other COMIFAC African countries in this series of reports. Having said that, the variety of species-rich habitats known to be present in the country leads one to consider that there remains great potential to increase the available knowledge of Gabonese biodiversity.

The purpose of this report has been to highlight the existing and potential role of species of relevance to Gabon for economic development in support of conservation. We would emphasise that our aim has not been to identify cases of biopiracy or misappropriation. In addition, the aim of the research was not to identify the complete portfolio of patent activity for a particular species or genetic resource. We have focused on those patent documents that make direct reference to Gabon or where distribution data suggests that Gabon is a likely source.

The next section presents a summary card for each species identified in the course of the research. An online interactive version of these cards will be made available through abspat.net to facilitate further research.

Species Summary Tables

The following summary tables describe the species and patent activity involving the species. This data is based on known distribution of species and any reference to traditional knowledge and use of that species:

In reading these tables note that the number of documents refers to the number of documents retained during research on the origin of species of relevance to Gabon. It does not refer to the wider patent landscape for the species consisting of the total of number of documents making reference to the species, or its components, in the global patent system.

Species may appear in patent documents in this list for a variety of reasons:

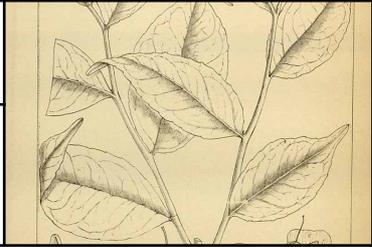
1. Because they are a focus of the invention;
2. Because they are a target of the invention (i.e. pathogens);
3. Because they are incorporated into the claims of the invention;
4. Because a reference to a species, including in very limited cases a literature reference, indicates that the species is of potential interest for economic development and merits further investigation.

This report focuses on identifying species that are of potential interest for economic development and conservation based on their appearance in patent data. The data in this summary section should not be used to draw conclusions about misappropriation or biopiracy.

Species name: <i>Allanblackia gabonensis</i>	Kingdom: Plantae	
Brief description of species: Allanblackia gabonensis is a species of flowering plant in the Clusiaceae family. It is found in Cameroon and Gabon. Its natural habitat is subtropical or tropical moist lowland forests.		
Distribution: Cosmopolitan	No of documents: 1	
US20110263694A1		
Detail: A method of preventing and treating chronic leukemias chosen from B-cells chronic lymphoid leukaemia by administering to a patient an effective amount of a xanthone derivative.		

Species name: <i>Aucoumea klaineana</i>	Kingdom: Plantae	
Brief description of species: A tropical hardwood tree, a very important timber tree for Gabon for manufacture of marine and aero grade plywood.		
Distribution: Cosmopolitan	No of documents: 4	
WO1998026750A2 US2002006416A1 US6676952B2 DE69712099T2		
Detail: The invention concerns novel uses of an extract of gaboon resin in cosmetics and pharmaceuticals, in particular for dermatological purposes.		

Species name: <i>Beilschmiedia fulva</i>	Kingdom: Plantae	
Brief description of species: Beilschmiedia is a genus of trees and shrubs in the family Lauraceae. Most of its species grow in tropical climates.		
Distribution: Cosmopolitan	No of documents: 2	
US2004138313A1 US7019028B2		
Detail: The invention relates to compounds and process for their preparation starting from the plant <i>Beilschmiedia fulva</i> and the use thereof for producing a medicament for allergic disorders.		

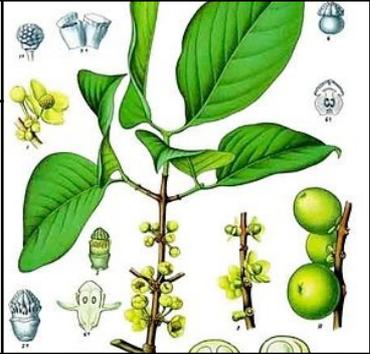
Species name: <i>Brazzeia soyauxii</i>	Kingdom: Plantae	
Brief description of species: <i>Brazzeia</i> is a genus of flowering plant species belonging to the family Lecythidaceae. It comprises twelve species.		
Distribution: Cosmopolitan	No of documents: 6	
US2010004480A1 US2009192327A1 US2008145322A1 US2007014739A1 US2006014285A1 US7612045B2		
Detail: The invention discloses compounds, compositions, and methods of using such compounds and compositions to inhibit, reduce, prevent, and remove biofilms. The invention further relates to methods of inhibiting biofilms on various substrates, such as medical devices.		

Species name: <i>Buchholzia coriacea</i>	Kingdom: Plantae	
Brief description of species: Buchholzia is a genus of flowering plants belonging to the family Capparaceae. It comprises six species. The tree is known to have traditional medicinal uses.		
Distribution: Cosmopolitan	No of documents: 2	
WO2005089705A1 US2007178059A1		
Detail: The invention is concerned with a composition comprising an extract of a plant belonging to the genus Buchholzia and auxiliaries and/or additives, which are common for cosmetic purposes. Said composition and said extract can be used for cosmetic purposes. Furthermore said extract can be used for pharmaceutical purposes.		

Species name: <i>Buchholzia macrophylla</i>	Kingdom: Plantae	
Brief description of species: Buchholzia is a genus of flowering plants belonging to the family Capparaceae. It comprises six species. The tree is known to have traditional medicinal uses. B. macrophylla is a synonym of B. coriacea.		
Distribution: Cosmopolitan	No of documents: 1	
FR2858935A1		
Detail: Use of at least one extract of a plant of the family Liliaceae and at least one extract of a plant of the family Capparidaceae in, or for preparation of, a composition for stimulating the immune defence system.		

Species name: <i>Cercocebus torquatus</i>	Kingdom: Animalia	
Brief description of species: Species of collared mangabey, found in West Africa and distributed from Guinea to Gabon.		
Distribution: Cosmopolitan	No of documents: 3	
WO2000034529A1 US2003162170A1 US6521739B1		
Detail: The nucleotide sequence and deduced amino acid sequences of the complete genome of a simian immunodeficiency virus isolate from a red-capped mangabey. The invention relates to the nucleic acids and peptides encoded by and/or derived from these sequences and their use in diagnostic methods and as immunogens. Strain obtained from pet mangabey from Gabon.		

Species name: <i>Diospyros dendo</i>	Kingdom: Plantae	
Brief description of species: D. dendo is a valuable timber tree with very black and hard heartwood known as black ebony, as billetwood, or as Gabon, Lagos, Calabar, or Niger ebony.		
Distribution: Cosmopolitan	No of documents: 6	
US2010004480A1 US2009192327A1 US2008145322A1 US2007014739A1 US2006014285A1 US7612045B2		
Detail: The invention discloses compounds, compositions, and methods of using such compounds and compositions to inhibit, reduce, prevent, and remove biofilms. The invention further relates to methods of inhibiting biofilms on various substrates, such as medical devices.		

Species name: <i>Garcinia punctata</i>	Kingdom: Plantae	
Brief description of species: Garcinia is a plant genus of the family Clusiaceae native to Asia, Australia, tropical and southern Africa, and Polynesia. The number of species is highly disputed, with various sources recognising between 50 and about 300. Commonly, the plants in this genus are called saptrees or mangosteens.		
Distribution: Cosmopolitan	No of documents: 2	
US2004082662A1 US6956061B2		
Detail: The invention relates to compounds which are produced by the plant <i>Garcinia punctata</i> , chemical derivatives derived therefrom, a process for their preparation, and their use as pharmaceuticals, in particular for the treatment and/or prophylaxis of bacterial infectious diseases.		

Species name: <i>Harungana madagascariensis</i>	Kingdom: Plantae	
Brief description of species: Harungana madagascariensis is a species of flowering plants in the family Hypericaceae and the sole member of the genus.		
Distribution: Cosmopolitan	No of documents: 2	
WO1998025639A1 US5837255A		
Detail: The use of extracts of Harungana or Vismia spp. as hypoglycemic agents, as well as methods for obtaining the hypoglycemic agents. The extracts or anthracenone compounds harunganin and vismin are useful for treating insulin-dependent (type I) and non-insulin-dependent (type II) diabetes.		

Species name: <i>Paspalum conjugatum</i>	Kingdom: Plantae	
Brief description of species: A member of the Poaceae family of grasses which grows across many tropical regions.		
Distribution: Cosmopolitan	No of documents: 1	
WO2005021019A1		
Detail: A pharmaceutical composition comprising an extract which has an antiviral and antibacterial activity, the inventive composition can also be used to stimulate immune defences		

Species name: <i>Pentadiplandra brazzeana</i>	Kingdom: Plantae	
Brief description of species: The sole species in the plant genus Pentadiplandra, discovered in 1985.		
Distribution: Cosmopolitan	No of documents: 7	
WO1995031547A1 WO1994019467A1 US5741537A US5527555A US5346998A US5326580A EP684995A1		
Detail: A protein sweetener that has been isolated from Pentadiplandra brazzeana. The sweetener is thermostable, lysine rich, and has a relative long lasting taste. Also disclosed is a recombinant host capable of producing the sweetener in large quantities. Compositions of this sweetener with other sweeteners are also disclosed.		

Species name: <i>Tabernanthe iboga</i>	Kingdom: Plantae	
Brief description of species: A shrub from central Africa known for the hallucinogenic properties of the bark when chewed, which has led to it being used for local ritualistic purposes.		
Distribution: Cosmopolitan	No of documents: 14	
WO2008039179A1 WO1997005869A1 WO1996003127A1 WO1991018609A1 WO1985002115A1 US2006229293A1 US2003153552A1 US6348456B1 US6211360B1 US5958919A US5925634A US5629307A EP0859610B1 EP0804200B1 US4587243A		
Detail: Extract used for a composition comprising Ibogaine, an indole alkaloid, its active salts and its principal metabolite noribogaine, a demethylated form of ibogaine, for the treatment of hepatitis C and hepatitis C related complications. US6211360B1 The invention relates to ibogamine congeners and to methods for treating addictive behaviour.		

Species name: <i>Vismia guineensis</i>	Kingdom: Plantae	
Brief description of species: A shrub or small tree, up to 15 m tall, common in secondary formations in the rainforest zone.		
Distribution: Cosmopolitan	No of documents: 2	
WO1998025639A1 US5837255A		
Detail: The use of extracts of Harungana or Vismia spp. as hypoglycemic agents, as well as methods for obtaining the hypoglycemic agents. The extracts or anthracenone compounds harunganin and vismin are useful for treating insulin-dependent (type I) and non-insulin-dependent (type II) diabetes.		

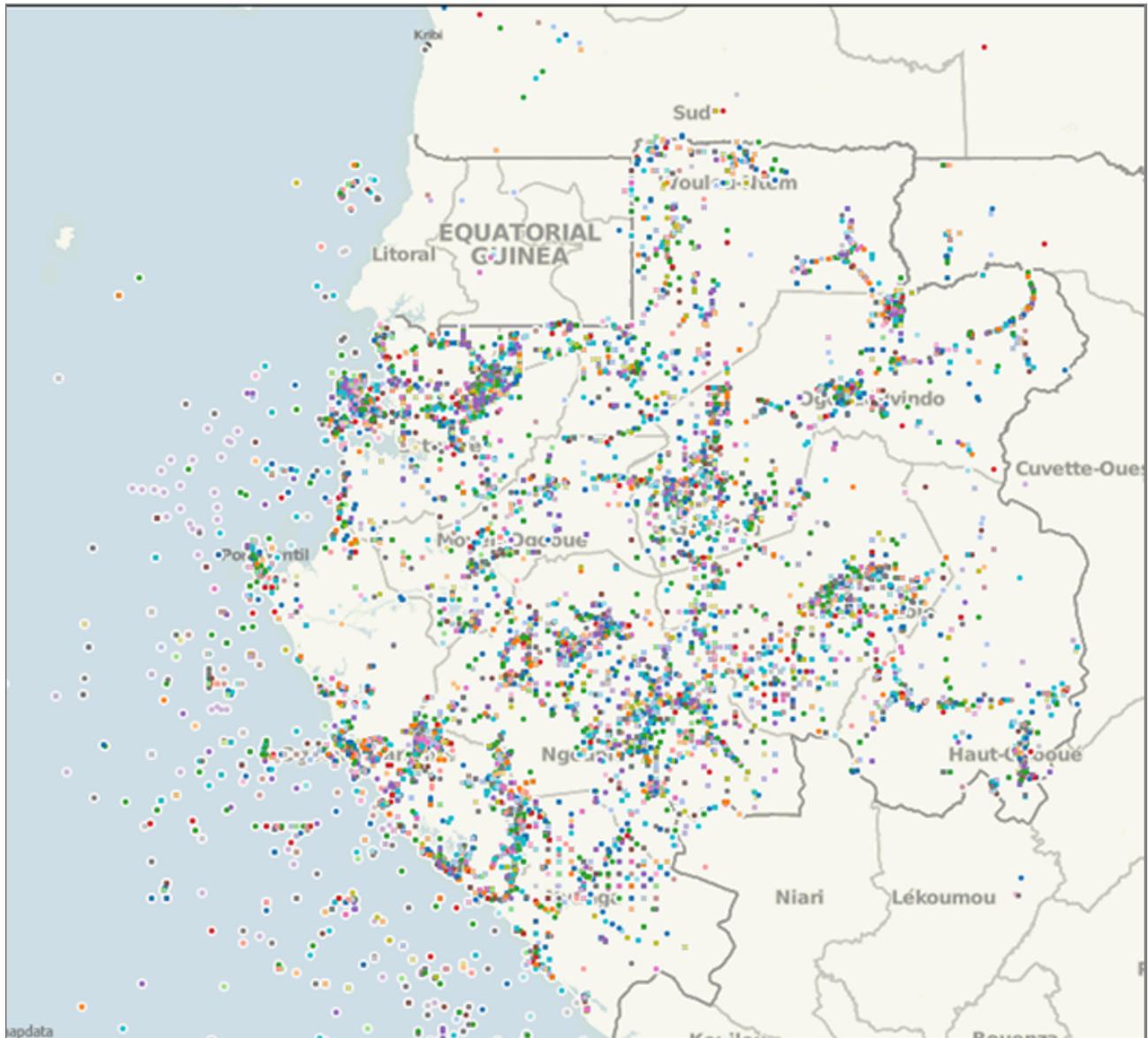
Image Credits

Allanblackia gabonensis - Martin Cheek/Royal Botanic Gardens, Kew [Allanblackia-gabonensis-flowers.jpg](#)
Aucoumea klaineana - D. Loupe [022 Aucoumea klaineana HPIM6263.JPG](#)
Beilschmiedia fulva - [beiful0.jpg](#)
Brazzeia soyauxii - [34030.jpg](#)
Buchholzia coriacea - [Buchholzia coriacea\(wonderful kola\).JPG](#)
Cerrocebus torquatus - Kevin Schafer [219lg.jpg](#)
Diospyros dendo - Semnoz [800px-200412 - Plaqueminier et ses kakis.jpg](#)
Garcinia punctata - Franz Eugen Köhler [Garcinia morella - Köhler-s Medizinal-Pflanzen-063.jpg](#)
Harungana madagascariensis - Bart Wursten [140420-1.jpg](#)
Paspalum conjugatum - Wee Yeow Chin [b8a43249ee0c13ebed5667654307fc89.jpg](#)

Pentadiplandra brazzeana - E Dounias [Pentadiplandra brazzeana shrub roots E. Dounias.jpg](#)
Tabernanthe iboga - CiXeL [iboga.jpg](#)
Vismia guineensis - Alex Popovkin [10027_580_360.jpg](#)

Appendix 1

Distribution map of GBIF records in Gabon coloured by taxonomic kingdom.



Kingdom
■ Animalia ■ Bacteria ■ Chromista ■ Fungi ■ Plantae ■ Protozoa