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# The inequity of species names: the flora of New Caledonia as a case study

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## Abstract

Since Linnaeus popularized the system of binomial nomenclature to describe living organisms, it has been common practice to name species after people (eponyms). Trends in species naming were analyzed in the endemic flora of New Caledonia, a biodiversity hotspot in the South-West Pacific. It was found that eponyms were predominantly from France and other European countries, and to a lesser extent from neighboring countries in Oceania or North America. Today, just 7 % of these eponyms were born in New Caledonia, and 6 % were women. Most of the corresponding species were described in the past five decades. Although the evidence is still preliminary, the name of a species appears to have a significant impact on how people relate to it, and this may be especially important for threatened endemic species and the willingness of local populations to preserve them. Because newly described species are often rare and endangered, adopting a more balanced approach to species naming may help to secure their future, particularly given the current extinction crisis.

Keywords: conservation, Matilda effect, perception, taxonomy

## INTRODUCTION

Carl von Linné made a tremendous contribution to science by popularizing the use of binomial nomenclature (e.g. *Solanum tuberosum* for potato), the two-term system used today to formally name all living species on Earth. In *Species Plantarum* (Linnaeus 1753), which is considered to mark the beginning of modern botanical nomenclature, he described over 7,000 species of land plants. More recent estimates place the number of named vascular plant species at 308,312 (Christenhusz and Byng 2016) and 383,671 (Lughadha et al. 2016). The inventory of global plant diversity is an ongoing effort, impacted by the addition of c. 2,000 newly described vascular plant species each year over the past four decades (Lindon et al. 2015; Christenhusz and Byng 2016). The genus name (first term of the binomial) and specific epithet (second term of the binomial) that define a species can derive from vernacular names or various features of organisms: morphological features, size, color, flowering time, habitat, geographical origin, etc. When describing a new species, finding a novel and unique binomial is not always easy, and cases of homonyms, i.e. two different species described under the same name, are not rare. Carl von Linné himself sometimes named species after people, thus initiating the use of eponyms, a term that refers both to the name of the new species and to the person for which the species is named. For example, the generic name of the cardinal flower (*Lobelia cardinalis*) commemorates the botanist Matthias de l'Obel (1538-1616), while the specific epithet of the fen orchid (*Liparis loeselii*) commemorates another botanist, Johannes Loesel (1607-1655). This practice has continued today with the recently described fern genus *Gaga* dedicated to the artist, Lady Gaga (Li et al. 2012), and a lichen, *Caloplaca obamae*, dedicated to the former U.S. president Barack Obama (Knudsen 2009). Thus, species names can bear the footprint of history, reflecting trends in popular culture as well as honoring those who have made significant contributions to biodiversity science.

New Caledonia is an archipelago in the South-West Pacific widely acknowledged as a biodiversity hotspot for its rich, unique, and endangered flora (Myers et al. 2000; Lowry et al. 2004). It is remarkable for its high rate of endemism; c. 75 % (c. 2,500 species) of the vascular plant species are found nowhere else in the world (Morat et al. 2012; Munzinger et al. 2020). New Caledonia hosts a multicultural population that results from several waves of migration. Austronesians were the first settlers c. 3,000 years ago (Sand et al. 2012), and James Cook's second voyage around the world (1774) marked the beginning of the exploration and settlement by Europeans and other communities. Today, New Caledonia is a French Overseas Territory with a special status since the 1998 Nouméa accord, and thus a high degree of autonomy. In particular, each of its three provinces, South Province, North Province, and Loyalty Islands Province, have had sovereignty over their biodiversity since 1999 (Martini 2006). The high endemism of the archipelago implies that most New Caledonian plant species were described with material collected on the island, often by specialists of the local flora. Thus, the etymology of plant names is more trackable in New Caledonia than in many other places. A recent study on worldwide birds (2020) revealed that most birds species described in the last few decades were from the Tropics and that most eponymous species tended to be named after non-local men. In the study, I wanted to test how this apply to plants, a larger group where new species are still routinely described. For this purpose I sought to determine for whom the endemic plants of New Caledonia were named, where applicable, and to quantify the representation of local people and women in eponyms. Likely implications for conservation biology are also discussed.

## METHODS

The most recent checklist of the flora of New Caledonia (Munzinger et al. 2020, accessed 1st February 2020) was used, and only accepted names (i.e. not synonyms) of endemic species (i.e. those necessarily described from material collected on the archipelago) were considered. I searched for all plant species with a specific epithet terminated in *-ii*, *-anum*, *-orum*, *-ae*, as these suffixes are used when naming species after people. This termination can also reveal the gender of the eponym; for example, *Arnica eastwoodiae*, was named after a woman, Alice Eastwood, and *Arnica flodmanii* was named after a man, Julius H. Flodman. Generic names were not considered. I used the year of publication of the basionym (original name) for any names that have later combinations in other genera. For each species named after a person, I identified the relevant individual, his/her gender, whether the specific epithet was built on the person's first or last name, and the person's citizenship. Information was gathered from a range of resources, particularly the compilation of plant collectors in New Caledonia (Morat 2010), original publications, the library at the Natural History Museum in Paris, local sources in New Caledonia, and other sources on the internet. When possible, I distinguished people born in New Caledonia from those born elsewhere in France (largely metropolitan France). Although New Caledonian citizenship does now exist, it is a recent concept (since the Nouméa agreement in 1998) and thus has limited historical relevance.

## RESULTS

A total of 652 taxa in the vascular flora of New Caledonia (c. 24 % of endemic taxa) appear to have been named after people, and in 98% of these cases, it was possible to identify or infer the eponym involved (supplementary data). The full name of the eponymous person were not always explicitly stated in species descriptions, particularly in earlier publications. Among the eponyms, French was by far the most represented citizenship (7% New Caledonian born, 63 % other French). This can be explained by the fact that New Caledonia has been administered by Metropolitan France since 1853, and by the important contribution of French botanists to collecting specimens and describing species for the flora of New Caledonia. Other European citizenships were also well represented (figure 1), and in most cases, this finding could be associated with botanists who made important collections on the island: Robert Compton (expedition in 1914-1915, from UK), Rudolf Schlechter (1902-1903, Germany), Karl Sarasin (1911-1912, Switzerland), and Hans Hürlimann (1950-1952, Switzerland). Their collections were typically deposited in institutions in their home countries and studied by botanists from those countries. This probably explains why most plants named after British citizens were described by British botanists, and the same was also true for Germans. Other common eponyms are from the neighboring countries of Australia and New Zealand, as well as from the USA and Canada, and 75 % of these names were published since 1970, indicating a recent trend.

The only plant species that was named after an African person seems to be *Neoguillauminia cleopatra* (Baill.) Croizat (originally published as *Euphorbia cleopatra* Baill.). The species is presumably named after the last Queen of Egypt, although Henri Baillon (1827-1885) did not normally provide information on the etymology of the species he described. Only 6 % of the plants that were named after people were named after women. This could be partly explained by the fact that only a small proportion of the world's plants have been described by women (< 3 %, Lindon et al. 2015), although the data did not allow a comparison of naming practices used by male and female taxonomists. An additional

difference between male and female eponyms was that species epithets honoring women were more often built on first names (68 %), while this practice was rare in plants named after men (2 %). Most of the plants named after women during the 19<sup>th</sup> century were described by Henri Baillon, and it was not possible to trace the source since no family name was given. The loss of the last names of these women further contributes to the loss of their memories (Anthony 2015, 2018). It is therefore another manifestation of the Matilda effect (Rossiter 1993): the under-recognition of women's contributions to science compared to the contributions of their male colleagues.

## DISCUSSION

Completing the inventory of Earth's biodiversity is of paramount importance to its preservation (Wilson 2017), and how new species are named may have important consequences for their fate. The name of a species can have a significant impact on our perception of that species. Carwell et al. (1998) asked visitors to London Zoo to rank photographs of animals in the order they would choose to help their conservation, with or without their common names as captions. Names had a negative effect on the ranking of species such as the Strawberry Poison Frog or the Red-faced Black Spider Monkey. On the other hand, the name had a positive impact on species such as the British Wartbiter cricket or the Diana Monkey. Similar results were later obtained in an independent survey with students of an American university (Karaffa et al. 2012). Although it has not been investigated, it is likely that New Caledonians lack any particular attachment to species named after botanists or other persons who are unknown to them. Such naming practices may not be the best strategy for ensuring the long-term survival of endangered species.

Most of New Caledonia's endemic plant species that were named after people born in New Caledonia (c. 7 %) and/or after women (c. 6 %) were described within the past five decades (figure 2), although this trend in species naming seems to have stalled. In a comparable study on worldwide birds described since 1950, DuBay et al. (2020) made similar observations; most recently described bird species occurred in developing countries, but they were typically named after men from developed countries. The under-representation of local people and women in species names within both the tropical avian fauna and New Caledonian flora likely reflects a general bias in the naming of species.

The world's herbaria house a very large number of plant species awaiting description (Bebber et al. 2010), including many from New Caledonia, where on average one new species has been described every month since 2000 (Gâteblé et al. 2018). So far, vernacular names or traditional uses have rarely been used to build scientific names (e.g. *Planchonella wakere* (Pancher & Sebert) Pierre, Sebert and Pancher 1874). The flora and fauna are marked by a pronounced micro-endemism (Wulff et al. 2013; Caesar et al. 2017), as many species are restricted to a single location or region. Naming species after places seems therefore appropriate. This approach could have positive impacts on the perception of these species by the local community (Sarasa et al. 2012) and could revive indigenous place names and strengthen the connection of people to their land (Ferdinand 2019, p. 302). New approaches are possible, such as the naming of a micro-endemic species after a clan of the local tribal village (Gâteblé et al. 2019). In astronomy, the Hawaiian language has been used to name celestial objects that are discovered in Hawaii's world-class telescopes (Witzke 2019) in order to connect indigenous culture with scientific discoveries. With some 30 kanak languages, New Caledonia is part of the Melanesian language hotspot (Anderson 2011), and thus offers a rich library from which species epithets can be derived.

## CONCLUSIONS

A review of eponyms in the flora of New Caledonia reveals a bias in naming practices with an under-representation of local people and women, and this finding is echoed in a recent study of naming practices in birds. Conservation science needs to be more inclusive (Tallis and Lubchenco 2014), and the naming of new species offers an excellent opportunity to acknowledge more broadly the diversity of individuals who have contributed to our understanding of the natural world. Areas of high biodiversity often overlap with areas of high linguistic diversity (Gorenflo et al. 2012), but the links among biodiversity and cultural and linguistic diversity are often underappreciated (Frainer et al. 2020). To promote the preservation of biodiversity, species should be named with an eye toward how these names will be perceived by the local communities involved. This practice could be added as a formal recommendation in article 23 of the International Code of Nomenclature for algae, fungi, and plants.

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Figure 1. Citizenship of people after whom New Caledonian plants have been named. The sizes of the rectangles are proportional to the number of people. Place of birth was used as a surrogate to distinguish New Caledonian from other French.

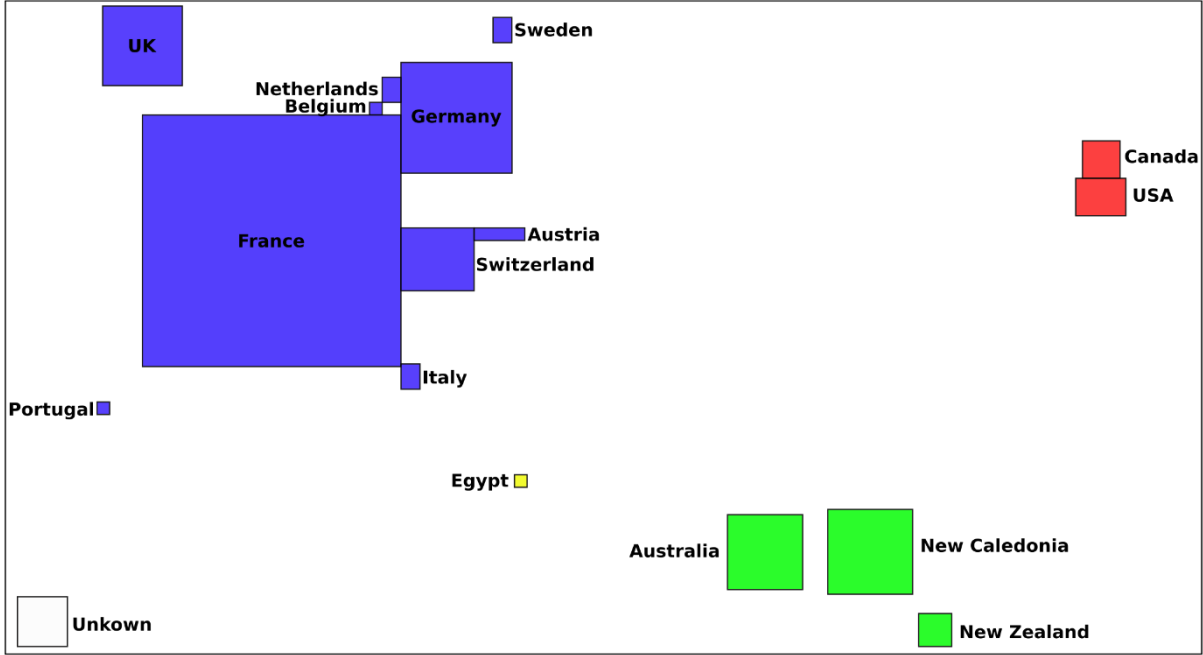


Figure 2. Change through time of the percent of species named per decade after people born in New Caledonia (dotted red) or women (hatched green).

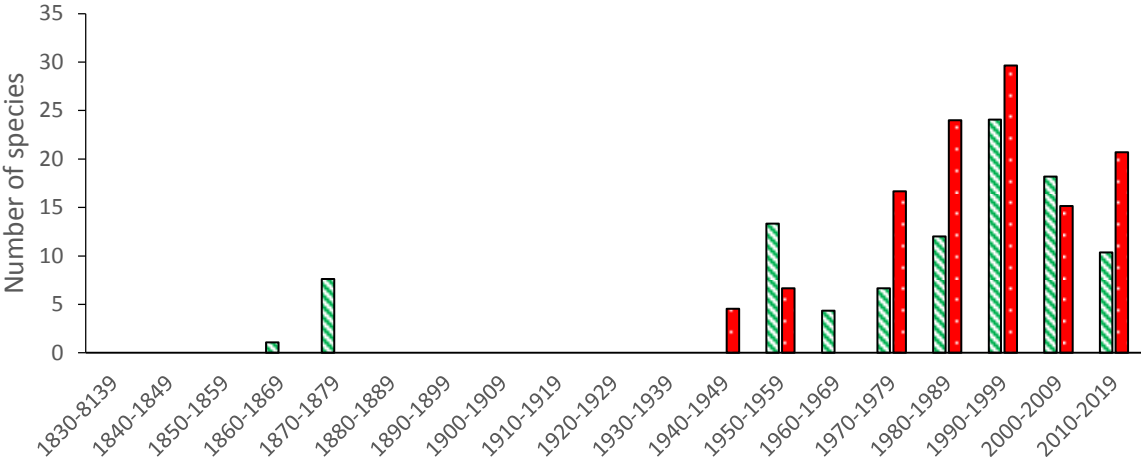


Figure 3. Examples of the two most common female eponyms in the flora of New Caledonia. Left: *Ixorara margaretiae* (N. Hallé) Mouly & B. Bremer (Vulnerable). Margaret MacKee was the wife of Hugh MacKee, the most prolific botanical collector of New Caledonia (c. 30,000 collections). Although she accompanied him on most of his trips, her name rarely appears on herbarium labels. Right: *Sphenostemon tireliae* Jérémie (Endangered). Christiane Tirel was assistant professor at the French National Museum of Natural History. She authored the taxonomic treatment of five families for the book series “Flore de la Nouvelle-Calédonie”. She also translated the treatment of 15 other families without being credited as an editor.

