PERSPECTIVE

Dragon Trees, Von Humboldt, and Napoleon: Water Hyacinth's Journey to Africa

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Abstract

This paper provides an account of the German naturalist and explorer - Alexander von Humboldt's role in the migration of water hyacinth ([*Eichhornia crassipes* (Mart.) Solms], from its native range in the Amazon to other parts of the world between 1800 and 2000 [1]. Humboldt (1769-1859), an avid plant collector, transplanted this free-floating aquatic species, renowned for its beauty as a wildflower, from its natural habitat in the Orinoco River in the Amazon Basin, first to the botanical gardens in North America and Europe at the beginning of the 19th Century. By the mid-19th Century, his network of scientists had already transferred the plant from European botanical gardens to Asia, Australia, Oceania and Africa, as a fish-breeding facility, an ornamental beauty, and a plant of interest to botanical research. By the last quarter of the 19th Century, the plant had become well-adapted to conditions in countries where it had been introduced, and spread aggressively, especially in Egypt, South Africa, and the USA. Its fame rose as both an obnoxious aquatic weed and multipurpose plant. During the imperial wars of the early 20th Century, European colonial armies used mats of water hyacinth as screens against enemy detection.

In recent decades, water hyacinth has been declared the worst aquatic weed ever seen in Africa's watercourses. It challenges navigation in natural and artificial waterways. Nonetheless, Africans turned this ecological disaster into an economic asset with the guiding spirit – 'if you can't beat the mats, join them'. The narrative of water hyacinth, therefore, represents one of the yardsticks with which to measure the depth and extent of Humboldt's influence in both temporal and geographical space. Based on his personal accounts, herbaria data, and published literature, this paper provides a brief introduction to the role of this German naturalist in the migration of water hyacinth and perspectives on the influence of plant collectors of the past centuries on the spread of species during the colonial era.

Key words: Water hyacinth, *Eichhornia crassipes*, African lakes and rivers, Dragon tree, Alexander Von Humboldt, Napoleon, ecology, environment, aquatic weeds.

[1] The article is a brief account based in part on the author's recent book on *A History of Water Hyacinth in Africa: The Flower of Life and Death from 1800 to the Present* Published in 2018 by Lexington Books - Rowman & Littlefield Press.

Introduction

As Alexander Von Humboldt tells us in *Cosmos,* childhood tales of a colossal African Dragon tree [*Dracaena draco* (L.) L.] in the old tower of the Berlin Botanical Garden stimulated his desire for adventure (Gendron, 1961; Humboldt,1858). The Nile River Basin was Humboldt's first target for adventure and exploration, but Napoleon's military occupation of North Africa, from 1797 to 1801, shattered this dream, forcing Humboldt to opt for exploring Western Africa and South America.

The dragon tree, a native of the Western African islands and western Morocco, occupied a considerable space in his exploration accounts. Humboldt's botanical curiosity, applied to exotic plant and botanical gardens, signifies several things. First, it signifies the ways in which botanical gardens of the 18th and 19th Centuries inspired the naturalists' travels in search of exotic plants for transportation beyond the native ranges. Second, it points to the role African plants played in inspiring botanical curiosities in Europe during the early modern period. That inspiration, however, as the case of Humboldt illustrates, spiralled, and transformed Africa from a source of botanical curiosities into a recipient of exotic plants in the 19th Century. Thirdly, it points to the fact that the science and history of introduced plants are to be found in travel accounts and in botanical gardens' records.

This is why a focus on Humboldt's exploits is beneficial to the study of the plants that he collected and transferred to Africa. It is not just his exploration of Africa and African dragon trees that made him important, but his transfer of a major aquatic weed - water hyacinth [*Eichhornia crassipes* (Mart.) Solms] and many other plants from South America to Africa.

Furthermore, what makes Humboldt so important in the history of water hyacinth is the fact that before him, naturalists had described water hyacinth purely for botanical knowledge. He was also instrumental in contributing to the early development of plant ecology as a new branch of botany and made a significant impact by laying the foundations and scientific methodologies of climatology, limnology, geology and environmentalism (Huxley, 2007).

Between 1793 and 1813, Humboldt's pioneering ideas of environmentalism crystallized in *Florae Fribergensis Specimen,* in which he argued that altitude, climate, temperature, and geography determine where plants grow and become geographically distributed (Humboldt, 1793).

It is, therefore, significant that if the Greek word *Oikos* (from which the term *ecology* derives) means "*house"*, then Humboldt not only transplanted and physically housed water hyacinth in botanical seed banks, but also intellectually housed it in the science of plant ecology—where later generations cultivated and discoursed about it in abundance.

Expounding his views of humans and nature as integrated halves of a single whole, Humboldt (1858) inspired the theories of George Perkins Marsh that predominate current environmental studies. Leading environmental historians, such as Alfred Crosby (2004) drew heavily on this Humboldtian tradition. Most aggressively colonizing aquatic species in African watercourses today are linked to Humboldt's South American plant collections that reached European botanical gardens between 1800 and 1805. Subsequently, many were transferred to Africa through the agency of people and institutions linked to Humboldt and his plant collections.

On June 5, 1799, aboard the *Pizzaro*, a Spanish ship, Humboldt, and his French botanist Aimé Bonpland sailed from Spain through the West African coast to South America. On July 16, 1799, they landed at Cumana (Venezuela) where they stayed for several weeks collecting plants (Adams, 1969; Helferich, 2004).

Humboldt then spent five years collecting plants and botanizing through Venezuela, Ecuador, Colombia, Peru, Mexico, and the Caribbean Islands. Travelling overland, his party entered the Orinoco River at its confluence with Rio Apure [2], working their way upstream, collecting a considerable menagerie of species. Humboldt's accounts show that, during the exploration of the Orinoco's middle course, he collected only a few specimens, due to clouds of stinging insects and the unattractiveness of the riverine flora (Stearn, 1968).

However, the enchanting beauty of a floating herb that blocked the passage of his boat could not escape his attention. In April 1800, Humboldt recorded encountering "floating gardens which, in the tangle of the river's tributaries, covered mile-upon-mile with what we were sure were hyacinths, water

[2] The Orinoco is one of the largest rivers of South America. Its basin covers an area of about 990000 km², covering most of Venezuela and eastern Colombia (source: **https://en.wikipedia.org/wiki/Orinoco**. See also Bonnie Hamre, *Orinoco River*. About.com: South America for Visitors. Retrieved December 25, 2020).

lilies, and fantastically coloured heliotropes" (Duval, 1982).

This was a remarkable moment in the history of water hyacinth. Humboldt collected specimens, labelling them as "floating wood". He pressed, sketched, and sealed the plants in boxes and conveyed them down the Orinoco to Havana (Cuba) for shipment across the Atlantic to Europe in three consignments. We could safely presume water hyacinth was a dominant plant species among the species shipped across to Europe.

Historians can track these plant collections to Europe-based institutions and individual naturalists who subsequently transferred the plants to Africa for scientific experiment and acclimatization purposes.

In my recent book — *A History of the Water Hyacinth in Africa: The Flower of Life and Death from 1800 to the Present* (Kitunda, 2018), I have traced the origin of water hyacinth, as described above, from the watercourses of South America, to European botanical gardens, and then, further afield to Africa.

For safety, Humboldt divided his collections into three large consignments. One consignment was left in the care of friends in Cuba, while a box of manuscripts of herbals and collection of insects, under the care of a Franciscan monk was sent to France via Spain. This, unfortunately, was shipwrecked off the coast of West Africa.

The third consignment of 1,600 specimens, in the care of one James Fraser, reached King Charles IV of Spain, the Royal Society, and the Kew botanical garden in Britain. Then, from England, the last part of the consignment reached Humboldt's mentor, Carl Ludwig Willdenow, the Director of the Berlin Botanical garden (1801-1812).

In 1801, with the help of the Swedish taxonomist Olof Swartz, Willdenow published Humboldt's 'floating woods' as *Pontederia azurea*, a name that persisted for the next 80 years until the species was renamed as *Eichhornia crassipes,* (Mart.) Solms (Gopal, 1987). Botanists in all three countries immediately transferred the plant to Africa for scientific research and acclimatization. The botanist William Aiton Townsend carried some of it from Kew to the Cape for those purposes.

Centrally, *A History of the Water Hyacinth in Africa* (Kitunda, 2018) draws attention to an innovative methodology of tracking down the origins, collection, distribution, and ecological transformation of introduced plants using herbaria data of past collections. Most museums and botanical facilities hold varying sizes of herbaria and data on plants. These scientifically valuable source materials, rarely used in historical inquiry, carry copious notes and information that botanists have left behind. They show details of collectors of a given plant, location(s) where the plant was collected, date(s) of collection, reasons for collection, details of its natural habitat, uses and relationship with new environments.

The use of herbaria data and travel accounts of naturalists, such as Humboldt, allowed the reconstruction of the history of water hyacinth from South America to Africa via the European botanical gardens from the 18th to the 21st Century (Kitunda, 2018). The analysis of such information shows not just the history, but also the changing perceptions and responses to species, such as water hyacinth, among ordinary people, scientists, conservationists and policy makers, over the last 200 years.

In discussing the history of water hyacinth, several important questions arise. Rather than a pernicious legacy of "the white man's burden" introduced to beautify Africa, could water hyacinth actually be one of the means of rethinking discussions about biological imperialism and ecological mismanagement?

Could species, such as water hyacinth, be even beneficial to underdeveloped African economies? Water hyacinth and its behaviour in countries to which it has been introduced, also raises the question of whether aggressive colonizing species are truly dangerous and whether they should be relentlessly maligned. Does water hyacinth represent an example of a potentially beneficial effect of ecological imperialism? (*sensu lato* Crosby, 2004)

The historical analysis shows that water hyacinth was originally viewed positively for many decades until its abundance and aggressiveness forced changes in perception. However, in the latter half of the 20th Century and most certainly in the 21st Century, African countries seem to be realizing that the species can be extremely beneficial.

Many African countries, for instance, Rwanda, Burundi, Kenya, Ethiopia, Sudan, and Niger, now reclaim and utilize water hyacinth for a wide variety of uses, including extracting pollutants from sewage and industrial effluents, and for crafts, paper industries, biogas production, and animal feed resources.

Water hyacinth is now perceived not as an ecological disaster, but an economic opportunity if harvested and handled properly and managed in the waterways it occupies. The Lake Victoria and the Niger River Basins are good instances of this changing view of water hyacinth. Cottage industries of

all kinds have mushroomed in these two basins all centred on exploitation of water hyacinth as raw material for production of a wide range of valuable goods (Kitunda, 2018).

Such utilization approaches have been captured very much in poetry. In 1985, as water hyacinth aggressively invaded the Niger River Basin a renowned Nigerian parapsychologist-cum-astrologer, Dr. Okunzua recovered the following communication from the plant[3]:

> *"I am the leaf, the leaf of blessings and fortune. I have brought with me fortune and wealth to Nigeria. I am the leaf, I am full of wealth and blessings." (Edewor, 1988)*[4]

This epigrammatic passage encapsulates the precise perceptions among Africans of water hyacinth as potentially beneficial to land and people. Despite the claim that water hyacinth is a pest, it can potentially be dealt with in ways that poses no threat to the environment, but which may even be beneficial.

In their obsession with eradication of what have been dubiously labelled "invasive alien plants", the media, policymakers, and scholars appear to have failed to see the ambivalence of biological and ecological success of introduced species in their new environments.

By extension, new plants in new places may potentially constitute 'a boon not doom' to the area. It all depends on perceptions. As William Beinart and Peter Coates argued,

> *"...It is difficult to sustain an argument that all botanical immigrants should be uprooted and repatriated. If this were done the United States would have to subsist on tortillas and refried beans, South Africa on springbok burgers. . . Frangipanis and loquats, eastern exotics which have long beautified Cape gardens would disappear.*
>
> *"…So, would the vineyards of California and the Cape. But just as these countries' biological diversity has probably been enriched by importation, the success of particular plants threatens the variety of indigenous life. So, there must be a strong case for control of rampant invaders, even for eradication in niches specially set aside for attempts to nature indigenous splendor…"* (Beinart and Coates, 1995).

The above quotation reflects a discourse defining environmentalism from its beginnings as a scientific study in the mid-19th Century. Diverging from the Humboldtian view of plant transfers, George Perkins Marsh, America's first environmentalist, recognized the irreversible impact of man's actions on the earth. His 1864 book, *Man and Nature* had a global impact, setting the tone that gave rise to the twin concept of conservationism and sustainability:

> *"…Whenever man plants his foot, the harmonies of nature are turned into discords. Indigenous vegetable and animal species are extirpated and supplanted by others of foreign origin with new and reluctant growth of vegetable forms and with alien tribes of animals. These intentional changes and substitutions constitute indeed great revolutions…"* (Marsh, 1864).

These remarks may have influenced other environmental historians, such as Alfred Crosby and William Cronon, who also pointed out the unintended impacts of the botanical activities of naturalists and networks of institutions who transferred exotic plants across continents. New World plants would have not reached Africa without the actions of specific naturalists crisscrossing the Atlantic between the Eastern and Western Hemispheres. Humboldt's story, and water hyacinth's history, illustrate this point while providing an example of a discourse that we may call the "Botanical Atlantic".

Focusing on Humboldt as the principal carrier of Amazonian aquatic plants to African waterscapes illuminates the Botanical Atlantic connection across continents in the late 18th Century. Humboldt's discovery of water hyacinth in the Orinoco River of Venezuela's Amazon basin in 1800 falls within the narrative of a network of botanists and savants. Historians today will do well to not ignore these linkages between scientists and their influences on different corners of the globe.

[3] In the African worldview, nature speaks like humans! Indeed, there is a huge discourse on speech in animals, plants, and inorganic nature (see Margo DeMello, *Speaking for animals: Animal Autobiographical Writing* (New York: Routledge, 2012); Arien Mack, *Humans and Other Animals: Cross-Cultural Perspectives on Human-Animal Interactions* (Columbus: Ohio State university press, 1999).

[4] Poem of Dr. Okunzua quoted in J. O. Edewor, "Developing water hyacinth from menace status to national profitability level," In O. L. Oke, A.M.A. Irnevborc and T.A. Farri (Eds), Proceedings of the International Workshop on Water hyacinth," *FMST* (1988), l75-178; P. L. Bolorunduro, "Water Hyacinth Infestation: Nuisance or Nugget," *National Agricultural Extension Research and Liaison Services* (*NAERLS/ABt1)* Zaria, Kaduna State, Nigeria.

While we know much about the movement of peoples (associated with Humboldt) and ideas (associated with botanists, explorers, military officers, and others), water hyacinth easily moved across the Atlantic, from botanical collections to herb gardens to watercourses in Africa. Imperial networks of botanical and leisure gardens, fish hatcheries, experimental stations, museums, imperial armies and much else, served as the main vehicles through which hyacinth spread from Humboldt's collections to Africa.

The plant's introduction into Africa was part of the extraordinary movement of species between Africa, Europe and the Americas that accompanied the expansion of European political and economic systems in conquered territories over the last five centuries. The period of water hyacinth's transfer between South America and Africa, coincided with the rise and retreat of the "New European Imperialism"—a 19th Century movement in which seven European nations (Belgium, Britain, France, Germany, Italy, Portugal, and Spain) projected their political, economic, botanical, and cultural influence towards Africa and other large territories, such as India and Australia.

Water hyacinth's transformation during its long journey to Africa makes it an important part of the ecological dimension of imperialism and the Atlantic botanical connection of the Western and Eastern Hemispheres. However, the existence of multiple conduits of biological transfers speaks against a purely imperialist narrative of water hyacinth colonization of Africa's watercourses.

After the initial deliberate introduction, the species infiltrated African waterways through accidental and intentional human and non-human actions, some having nothing to do with empires. For instance, during the high floods in the 1950s, water hyacinth spilled over the Congo-Nile River divide into the Upper Nile. The resulting massive infestation of the White Nile within Sudan backed up the tributaries and eventually contaminated the Blue Nile in Ethiopia. These events had no direct connections with the previous human conquests and colonization events and European Empires (Kitunda, 2018).

The Dispersal of Water Hyacinth – Jefferson, Aiton, Delile, Napoleon, and Josephine

In 1804, when the United States President Thomas Jefferson (1746-1823) hosted Humboldt for six weeks on his voyage back to Europe, water hyacinth was not well known in the USA. Jefferson, an acute gardener, appear to have acquired water hyacinth from Humboldt and cultivated it in several places in the USA (Figure1).

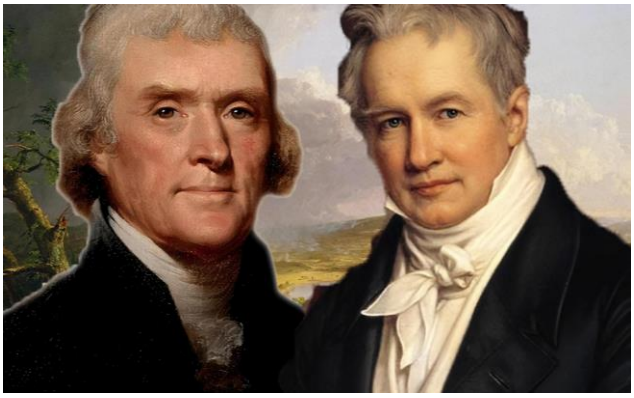

Figure 1. Thomas Jefferson (left) and Alexander Von Humboldt (right)[5]

Living in revolutionary societies, both men were deeply concerned with the human condition, and each vested hope in the new American nation as a possible answer to many of the deficiencies characterizing European societies at the time. Subsequently, water hyacinth reached the Congo through missionaries (Patterson, 1983) and South Africa through travellers returning from the USA botanical exhibition fairs. Such historical facts indicate the connection between Jefferson, Humboldt and water hyacinth's spread far away from its original home in South America.

From July 9, 1804 to August 3, 1804, Humboldt sailed from Philadelphia to France with "forty-two-boxes containing an herbal of six thousand equinoctial plants and seeds from the rivers of the Amazon (Helferich, 2004) (see Map in Figure 2).

While more than 6000 botanical specimens went to the French *Muséum National d'Historire Naturelle*, a special collection went to the *Jardin des*

[5] For more details on the relationship between Jefferson and Humboldt, see Sandra Rebok's 2014 book: *Humboldt and Jefferson: A Transatlantic Friendship of the Enlightenment*. Charlottesville; London: University of Virginia Press, 220 pp. The book explores the warm relationship between two fascinating personalities in the wake of Humboldt's famous expedition through the Spanish colonies in the spring of 1804. The two men corresponded a good deal over the years, speculating together on topics of mutual interest, including natural history, geography, and the formation of an international scientific network.

Plantes (also known as *Jardin du Roi*—the King's Garden) in Paris. Whereas Aimé Bonpland, Carl Sigismund Kunth and Auguste de Saint-Hilaire worked the collections into several publications, the Court botanist Alire Raffeneau Delile (1778-1850), a long-time associate of Humboldt and a member of Napoleon's expedition to Egypt shipped water hyacinth to acclimatization stations in Africa (Stoddard, 1869; Gendron, 1961).

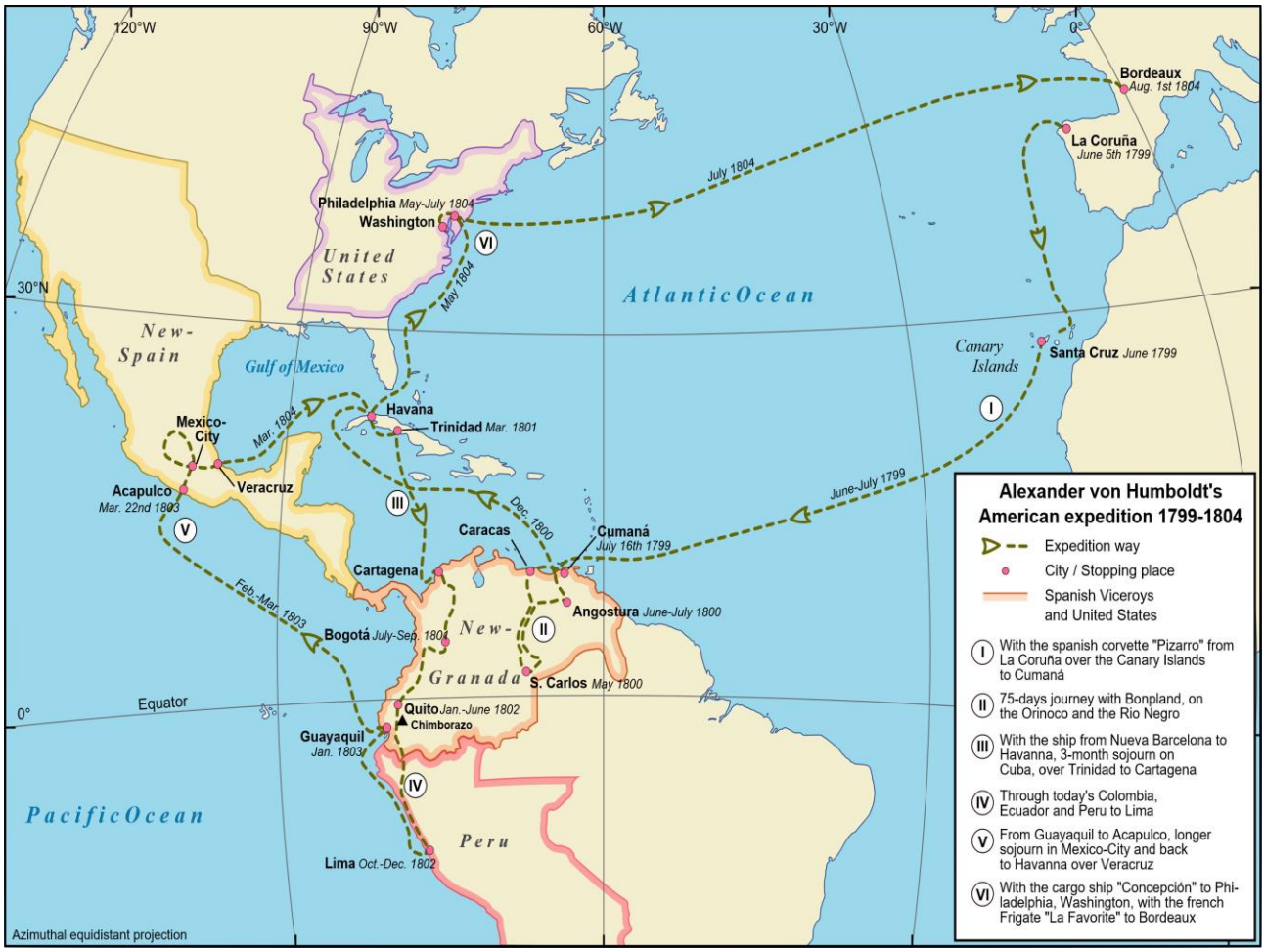

Figure 2. A Map showing Von Humboldt's expeditions (1799-1804) and possible routes of water hyacinth's travels (Source: By Alexrk translated by Cäsium137 (T.) </span, CC BY-SA 2.5, **https://commons.wikimedia.org/w/index.php?curid=7249639**).

Moreover, Aimé Bonpland impressed Empress Joséphine with a gift of flower-seeds from the Amazonian basin certainly including water hyacinth. Joséphine, an ambitious horticulturist, was delighted:

> *"…I am happy to see these foreign plants flourish and multiply. I wish Malmaison soon to offer a model of good cultivation and become a source of riches for the rest of France. It is with this in mind that I am having a very large quantity [from South America].*
>
> *"…I want each department within ten years to possess a collection of rare plants to have originated from my nurseries…"* (Bonaparte and Redouté, 1982).

Joséphine cultivated varieties of exotic plants in the greenhouses at Malmaison and later introduced them to France and French African dependencies between 1805 and 1810. She spent much time establishing extensive gardens of flowering plants, collecting and planting every kind of native and exotic flowering plant. Subsequently, following her example elite families established similar gardens at notable houses throughout Europe. Eventually these pursuits "trickled down to the masses" and gardening with exotic flowering plants became fashionable throughout Europe and colonial outposts in Africa

(Roebuck, 2007). The French court botanists classified most of Malmaison's garden plants with Joséphine's name.

The ten-volumes of *Jardin de la Malmaison* contains 502 plates of *Liliacées* and as proof of how important these plants were to the imperial class Napoleon bought eight copies as gifts for his guests. It is evident that the botanical passion of this French Empress supplemented the imperialist zest of her husband to bring water hyacinth to Africa.

Historical records also indicate that it was Alire Raffeneau Delile, a long-time associate of both Humboldt, Napoleon's family, and a member of Napoleon's expedition to Egypt, who pioneered modern Egyptian botany.

From 1799 and 1849, Delile maintained a botanical foothold in the Nile Delta in spite of the British overthrow of the French in Egypt. He also created the first French botanical gardens to cultivate and study floating plants on the Nile. More than 12,000 packets of seeds were shipped annually from Humboldt's Amazonian collections held in Joséphine's nurseries and the King's garden to the French botanical gardens in Egypt, Algeria, Tunisia, Morocco, West Africa, and the East African islands of Madagascar, the Seychelles, Mauritius, and Reunion (Duval, 1982).

Several developments made Delille the pivot of water hyacinth dispersal to Africa. He ascended to the position of the manager of the French Agricultural Garden at Cairo, the Director of the King's Garden, and professor of Botany at the University of Montpelier. Besides, in 1827, Humboldt himself settled at the Berlin Botanical Garden, giving Delile access to the garden. Delile thus could work closely with global botanical institutions that superintended transfer of Eichhornia to Africa.

In the 1850s, the spread of water hyacinth across the continents gained momentum with the rise of geographical exploration and acclimatization societies across Europe. Although Portugal, Spain and Holland had much earlier set the pace of plant acclimatization, it was the French (with greater imperial clout from Napoleon and Joséphine) who popularized the acclimatization movement across Europe and Africa.

The operations of French botanic gardens became the specialty of the *Société zoologique d'Acclimatation* which established branches in Africa (Gendron, 1961). The acclimatization program called on all Western countries to collaborate in populating European and colonial lands with new inhabitants as means of increasing productivity.

As a result, a succession of similar societies across Europe moved not just water hyacinth but hundreds of other plant species to Africa (Sonberg, 1990; Bright, 1999). In fact, it was through the British Acclimatisation Society that botanists in Egypt and South Africa were able to bring a variety of foreign plant species, perceived as beneficial, to these two important colonies (Anderson, 1992; Osborne, 1991 and 2000).

Receptions and Perceptions in the recent era

On May 6, 1859, Humboldt died leaving water hyacinth enjoying a high place among flowering plants in European royal gardens, private leisure pools and scientific institutions. The species was treasured as an indispensable, beautiful ornamental plant for European waterscapes and tropical pools.

As one of his contemporaries said, the introduction of a new plant in a country was more valuable than the discovery of a gold mine and more enduring than a pyramid. An appraisal of colonial botany of the 18th and 19th Centuries shows that water hyacinth has carried on and spread the legacy of Humboldt in Africa in its botanical complexity.

Among Africans the plant was well received as part of nature despite its immigrant status, just as European immigrant settlers were locally accommodated to blend and give birth to an African triple heritage of Asiatic, European, and African traditions (Mazrui, 1986)[6]. Nevertheless, between 1863 and 1889, two German scientists, Paul Friedrich Augus Ascherson and Georg Schweinfurth, reported that water hyacinth had run wild since the introductions by Delille (Ascherson and Schweinfurth, 1889).

Water hyacinth's innate capacity to be successful in a variety of environments was possibly not an important consideration in those early centuries when it was introduced across continents. However, as its aggressive growth and behaviour expanded, the species quickly became a concern and

[6] See also Mazrui, A. (1986). *The Africans [videorecording]: A Triple Heritage: A commentary* / by Ali A. Mazrui; a co-production of WETA-TV and BBC-TV; written and presented by Ali A. Mazrui; produced by Peter Bate. [Indianapolis, IN]: Annenberg Media, [1986]. 5 videodiscs (ca. 522 minutes): sd., col.; 4 3/4 in. Videodisc release of a 9-part television series originally broadcast in 1986. Mazrui, Ali Al'Amin, Screenwriter, Host, Narrator.

was perceived as a nuisance. Gopal (1987) argued that introduced 'exotic' plants are not necessarily undesirable unless they effectively compromise human interests.

In 1879, twenty years after the death of Humboldt, water hyacinth escaped from Egypt-based French and British botanical gardens, the Khedival gardens and plant acclimatization stations to become abundant everywhere in the Nile valley.

This was not only a turning point but also another remarkable moment in the history of water hyacinth which deserves explanation. The explosion of water hyacinth was aided by the 1870s floods, which struck Sudan and Egypt during an unsettled political climate owing to Anglo-French competition over control of the Nile valley (Muschler, 1970).

The transition of water hyacinth from a treasured ornamental plant to a "problematic aquatic weed" was a figurative convergence of its 'beauty-turned beast' character. The transition is linked with both political turmoil and natural catastrophes in the African continent. The narrative of a potentially aggressive species that can spread widely with or without the human agency had been written thus.

The lesson here is, after human introduction for botanical interests a strong colonizer species could escape from control due to external factors, such as a natural disaster or political turmoil in a country. The loss of ecological control and management could then lead to situations where the aggressive nature of the species may cause potential economic harm.

At the beginning, there was clearly a human aspect to this nexus of nature, turmoil, and spread of colonizing species. Hydrological changes, chemical-based farming, urbanization, and industrialization were key factors behind the transformation of introduced aquatic plants into problematic species.

As I have pointed out, in some cases, at least, such transformations were initiated during the era of colonial empires. During the 1870s, at least 80 years after Humboldt's introduction, water hyacinth was identified as an ecological pest for the first time outside its native range. Egypt assumed the reputation of being the first country where water hyacinth initially exhibited its capacity to be an aggressive colonizer.

The beauty Humboldt had seen in water hyacinth in April 1800 in the Orinoco River had made a remarkable transition within less than a century along the Nile River Basin, now seen not as an epitome of beauty but as a 'beast' that smothered other aquatic species and spelt doom for various human economic activities using waterways in part created by imperialism.

During the imperialist era channels were constructed for navigation and easy transportation of goods throughout Africa, and other occupying countries. These waterways provided a conducive way for aquatic species to spread. Africa's interconnected water bodies enabled water hyacinth to proliferate naturally and spread quickly, defying a purely imperialistic explanation of biological invasion.

It could be argued that water hyacinth overcame imperialism and charted its own course in Africa, and elsewhere because it is such a successful colonizing species.

From the second half of the 19th Century to the end of the Second World War, perceptions of water hyacinth remained capricious. However, in the second half of the 20th Century, water hyacinth became increasingly a subject of poetry and science. In the 1980s for instance, Evangeline Paterson's poem (1983), *Bringing Water Hyacinth to Africa,* captured water hyacinth's perceived impact on the African environment:

"…And who is to blame?
Some say a priest, Homesick of Florida
Some say a Belgian lady, all Africa
Or her backyard, set out
To prettify the Congo..."

"…And who's to say?
But pity whoever it was, who meant
No harm, and left, as monument
A thousand miles of curses and jammed
propellers (Patterson, 1983).

The poem illustrates four key points: firstly, water hyacinth's arrival and fecundity in colonizing African waterways; second, the plant's arrival via the agency of an American missionary or a female Belgium gardener; thirdly, the perception of the plant's beauty —to prettify the Congo and fourthly, that beauty can also be a problematic curse.

Once in the waterways of Africa, water hyacinth changed from an object of beauty into a species that caused obstruction of maritime activities and potentially, economic wellbeing. The mats clogged engines and propellers of commercial ships, transport and fishing vessels crippling local and regional economies and traffic. This was the refrain across the continent from the late 19th Century to the end of the Second World War.

The post-war era marked yet another intersection of the plants, political chaos, and natural

disasters. Remarkable political changes, especially in the 1950s and 1960s, swept away European colonial empires as African nationalists took leadership of their countries. This regime changes forced many European botanists and horticulturalists to abandon their water hyacinth-infested pools. Nevertheless, African regimes also continued the legacy of colonial environmental changes in the continent's waterscape that constitutes what Marsh and Crosby have termed 'disturbed environments', conditions, which are conducive to water hyacinth proliferation (Chandrasena, 2020).

From the 1960s to 1990s, military coups across Africa diverted attention from surveillance over water hyacinth. Issues of water hyacinth infestations and general environmental care took a back-seat. In the process, water hyacinth's history and science of control and utilization were lost as the expatriates fled. Archives and libraries containing records on water hyacinth were destroyed or left to decay.

This lost memory, perhaps, helps explain anxieties of the late 1980s when water hyacinth appeared with renewed strength to shock the 1990s generations, which viewed it as an 'alien' species with the potential to destroy African watercourses and human life. Inaction and disagreements in this discourse gave water hyacinth the best opportunity to expand further before African politicians and environmentalists began to realize the menace the species portends if unmanaged and ignored.

While the ecological imperialism thesis sees all this as a negative outcome of the "colonization process", a deeper historical analysis would support the view that other factors contributed to consequences of plant introductions. The evidence is that there are strong linkages between political turmoil, stable societies and economies and water hyacinth proliferation. Each country involved in the "perceived water hyacinth crisis" has also clashed with multinational companies operating within their boundaries.

While governments and institutions struggled to find a way out of the problem, riparian communities, for example those around Lake Victoria, devised their own means of coping with the invasive plant. Eventually, through a largely 'trial and error' approach, they have turned an ecological disaster into an economic asset. Fishermen have learned to co-exist with the movements of water hyacinth. Where floating aquatic species oscillate between river banks and lakeshores, depending on wind and water current, fishermen and sailors have adjusted their waterborne activities to the wind patterns (Kitunda, 2018).

History demonstrates that water hyacinth can be adopted and turned into an economic opportunity rather than an ecological-cum-economic peril in African watercourses. What is more, the connection between water hyacinth and disease is not clear. Iqbal (2009) questioned the same issue in Bengal and provided evidence that there is no connection between water hyacinth and human ailments, as claimed by the media.

Lakeshore residents of Lake Victoria have taken advantage of water hyacinth in planning their fishing, navigation, and water use activities. Moreover, jobless women and handicapped people have also come together to form community-based organizations to harvest water hyacinth and turn it into compost, animal feed, and biogas production. Others used water hyacinth as raw materials for weaving, manufacturing paper and pulp, furniture and other products that have attracted tourists.

A new economy based on water hyacinth has since been in the making— one could say, thanks to Humboldt. Kitunda (2018) reviewed considerable literature on this matter (See also Onyango, J., and Ondeng, M. 2015 and Segbefia, A. et al. 2019b).

Conclusions

There are several important conclusions one can draw from this analysis and account. Most importantly, the presence of water hyacinth in African waterways serves as the yardstick with which to measure the depth and extent of Alexander von Humboldt's legacy of plant collection and influence across the globe.

Regardless of their nationality, all human agents and carriers of water hyacinth to Africa were in one way or another connected to Von Humboldt, his plant collections, and botanical gardens associated with him. Secondly, the narrative of water hyacinth illustrates the fact that although environmental problems in the current era are often perceived as sudden and new manifestations of human destructiveness, the processes of environmental change we see nowadays are generally deeply-rooted in the past.

The history of water hyacinth in African waterways, currently viewed as a novelty, is deeply imbedded in the century-old course of European imperialism and botanical activities in Africa (Beinart and Coates, 1995). They are relics of a colonial past.

Yet imperialism was not the only factor that converted a plant introduced for beauty to one that has entered into a conflict with humans.

As demonstrated, the plant was initially useful as an ornamental plant for private citizens, a military asset to imperial soldiers in the tropics, and an economic asset to botanists and fish hatcheries. In the second half of the 19th Century, its immense proliferation transformed it into an ecological and economic problem, as it has been perceived to tamper with the wellbeing of native species and to impede human activities.

No doubt, the species has indeed been a problem in many situations as the vast literature on water hyacinth shows (Gopal and Sharma, 1981; Gopal, 1987).[7] However, in my view, the way forward, as illustrated in the African case, is to use historical sources to understand the implications of and solutions to such problems.

The ideal future scenario would be to balance the negative effects with positive benefits of introduced species and develop ways by which human societies can utilize the abundance provided by such species. As Chandrasena (2014) pointed out, not all such aggressive colonizer species are bad all the time. Negative impacts of colonizer species depend very much on circumstances and situations.

The science on the relationship between water hyacinth and fisheries exhibits unresolved tensions. From the late 18th Century to the end of the 19th Century, water hyacinth was viewed as a fish breeding facility and certainly, not as the killer of fish. However, there is now a large volume of literature that condemns water hyacinth as a killer of fish (due to oxygen depletion and other effects) and an obstacle to fishing in lakes, rivers and artificial reservoirs. At least in some cases, the evidence for such claims is unproven.

According to oral and written sources from Lake Victoria, for example, the advent of water hyacinth brought back indigenous fish species that were driven to the brink of extinction following introduction into the lakes of the exotic Nile perch fish species during the colonial era (Ayodo, 2008). Fishermen explained (and marine biologists concurred) that the mats of water hyacinth, unfavourable to the predatory perch, provided greater shelter and breeding facilities for indigenous fish than any vegetation before (Kateregga and Sterner, 2009; Segbefia, et al. 2019a; d).

There is consensus that the plant slowed fishing and navigation activities, as Patterson (1983) points to in her poem, allowing targeted fish to recoup their populations during the grace period when the riparian nations were fighting over what to do with hyacinth and during which the plant colonized large lake portions. This reflects the power of nature's resilience in the face of human-induced environmental mishap.

Grand attempts to use water hyacinth as a source of industrial raw materials may constitute not only an ecological revolution in Africa, but also a revolution in the legacy of Humboldt's water hyacinth in Africa. They could transform perceptions and thus trigger a sort of gold-rush scenario to possess the plant as a vital industrial resource. This would shift the nature of the current controversy from what to do with water hyacinth to one over who should own and protect it from illegal exploitation (Bolorunduro, 2002; Hauser, Wernand, Korangteng, Simpeney, and Sumani, 2014).

These are not speculative postulations, but assumptions based on the history of other plants in Lake Victoria, which were eventually cleared out of the lake after local people adopted them as raw materials (Kitunda, 2018).

Giving prominence and adapting the utilization approach is one way of reclaiming the beauty of water hyacinth by using it to mitigate deforestation, save indigenous species and provide for local economies a sustainable resource for developing the riparian regions of waterways. In doing so, we will, in a muted way, release and redeem water hyacinth 'history from the ecological imperialist paradigm.

Comparing the acclimatization movement of the 19th Century which saw the introduction of species as acts of heroism, and contemporary conservationism that sees species introductions as

[7] Contemporary weed scientists, especially those interested in water hyacinth and other aquatic weeds, should be aware of the important works of the Indian biologist - Brij Gopal. His monographs, published in 1981 (co-authored with K. P. Sharma) and 1987, have remained inaccessible to many since publication. Gopal reviewed exhaustively the literature on water hyacinth and other introduced aquatic species from all parts of the world listing all the sources from news paper reports, articles, herbaria specimens to monographs, from which I have drawn heavily. My book (Kitunda, 2018) contains a comprehensive bibliography of water hyacinth, relevant to Africa, as well as the scientific literature related to the historical journey of *Eichhornia.*

detrimental to local ecosystems, we can appreciate the complexity of issues related to once favoured colonizing species and plant transfers.

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Addendum I – The Naming of Water Hyacinth and an Update

The historical nomenclature of water hyacinth, as well as the early descriptions of the species, have been somewhat confusing, from the time of 18th Century Swedish Carl Linnaeus to the days of the 19th Century German botanist - Hermann Zu Solms-Laubach. The historical information is available in the Biodiversity Heritage Library, BHL), which is freely available online (**https://www.biodiversitylibrary.org/**).

The genus *Pontederia*, within which water hyacinth is housed, was originally named by Linnaeus in his *Species Plantarum* (1753) (available at: **https://www.biodiversitylibrary.org/item/84235#page/5/mode/1up**; see p. 288). In 1801, two botanists— Olof Peter Swartz (1760-1818, Swedish) and Carl Ludwig Willdenow (1765-1812; German) in an update to Linnaeus' *Species Plantarum* used the name *Pontederia azurea* to describe Humboldt's collections at the Berlin Botanical Garden. Willdenow had been a mentor to Alexander Von Humboldt and examined many plants that the explorer had collected in South America and sent to Berlin.

In 1824, the German botanist and explorer- Carl Freidrich Philipp von Martius (1794-1868), who brought to Europe immense collections of water hyacinth and other Amazonian plants, described water hyacinth as *Pontederia crassipes* in *Nova Genera et Species Plantarum* (Volume 1: p. 9. Available at: **https://www.biodiversitylibrary.org/item/9619#page/13/mode/1up**).

In 1843, the German botanist – Carl Sigismund Kunth, split the Linnaean genus *Pontederia* and created *Eichhornia* (in honour of Friedrich Eichhorn, an iconic Prussian Minister of Education) to cover species with trilocular ovary and numerous ovules. He ignored the epithet '*crassipes*', which von Martius had given, and gave the species the name *Eichhornia speciosa* Kunth.

In the second half of the 19th Century, European botanists reached consensus that all species that had been described as *Pontederia azurea*, *Piaropus crassipes*, *Pontederia crassipes*, and so on, were in fact the same species. Ignoring numerous combinations that had been previously applied by different authors, in 1883, Zu Solms-Laubach (1842-1915) established the name *Eichhornia crassipes* (Mart.) Solms by which the species became universally known (Gopal, 1987).

The revision of genus and specific names of plants is a continuous process and water hyacinth's name has been the subject of many such revisions. Water hyacinth is also described on page 527-528 of Alphonse De Candolle and Casimir De Candolle (Eds.) *Monographiae Phanerogamarum*, Volume IV. Sumptibus G. Masson, Paris, (1878-1896) (**https://www.biodiversitylibrary.org/item/100881#page/528/mode/1up**).

According to the *Kew Science Plant Index*, the accepted and preferred botanical name now is *Pontederia crassipes* Mart. although the synonym *Eichhornia crassipes* (Mart.) Solms is also accepted. The species has also been known under various other synonyms (see Kew Science, *Plants of the World* (**http://www.plantsoftheworldonline.org/?f=%2Caccepted_names&q=Eichhornia%20crassipes**).

Recent genetic analyses and a 'total evidence phylogenetic study' have placed the species under the genus - *Pontederia* but under a sub-genus *Oshunae*. Sub-genus *Oshunae*, is monospecific, being composed solely by *Pontederia crassipes* [See: Pellegrini, M., Horn, C. and Almeida, R. (2018). The 'total evidence phylogeny' of Pontederiaceae (Commelinales) sheds light on the necessity of its re-circumscription and synopsis of *Pontederia* L. PhytoKeys 108: 25–83].