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AI and Ethnolinguistic Preservation: Documenting Abureni Vocabulary on Water Hyacinth Infestation in Kugbo Creek

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Abstract

Water hyacinth (*Pontederia crassipes*) infestation in freshwater bodies has emerged as a critical environmental challenge, particularly within the Niger Delta's inland waterways in Nigeria. Kugbo Creek, a vital waterway in this region, sustains traditional livelihoods such as fishing, boat transportation, lumbering, and farming, serving as an economic lifeline for local communities. However, the proliferation of invasive species like water hyacinth threatens native aquatic ecosystems, disrupts socio-economic activities, and impedes navigation. This study explores the use of Artificial Intelligence (AI) tools to document and analyse Abureni vocabulary associated with water hyacinth infestation in Kugbo Creek. By leveraging Natural Language Processing (NLP) techniques, it seeks to preserve the linguistic heritage of the Abureni people while providing actionable insights for ecological interventions. This interdisciplinary approach highlights the transformative potential of AI in bridging language and environmental studies, emphasizing its role in amplifying indigenous perspectives on pressing ecological challenges. The findings advocate for collaborative, sustainable solutions by stakeholders to mitigate the water hyacinth menace and foster a deeper understanding of the interconnected ethnolinguistic and ecological dynamics within the Abureni communities along Kugbo Creek.

Keywords: Water Hyacinth, AI Tools, Abureni Vocabulary, Niger Delta, Ethnolinguistic

Introduction

Freshwater ecosystems play a crucial role in sustaining biodiversity and supporting traditional livelihoods, especially in regions reliant on aquatic resources. Within Nigeria's Niger Delta, Kugbo Creek serves as an essential waterway for fishing, boat transportation, lumbering, and farming. However, the unchecked proliferation of water hyacinth (*Pontederia crassipes*) presents a significant environmental challenge, disrupting native aquatic ecosystems, hindering socio-economic activities, and obstructing navigation. The invasion of this free-floating aquatic weed has displaced indigenous plant species and threatens local fisheries, exacerbating ecological degradation and economic instability in affected communities. While the adverse ecological and economic impacts of water hyacinth infestation have been widely studied, the ethnolinguistic dimensions of this phenomenon remain largely unexplored. Indigenous communities develop and sustain specialized terminologies to describe environmental changes, offering culturally embedded perspectives on ecological disturbances. However, many of these linguistic expressions are at risk of fading due to the gradual erosion of indigenous languages and the dominance of non-native tongues. Preserving such linguistic heritage is vital for safeguarding traditional ecological knowledge and fostering localized responses to environmental challenges. This study investigates the application of artificial intelligence (AI) tools, particularly natural language processing (NLP), to document and analyse Abureni vocabulary related to water hyacinth infestation in Kugbo Creek. By leveraging AI-driven linguistic analysis, the research seeks to preserve the language and knowledge systems of the Abureni people while contributing to ecological intervention strategies. Through an interdisciplinary approach that bridges AI technologies with environmental and linguistic studies, this study underscores AI's potential to amplify indigenous perspectives on ecological disruptions. Furthermore, the findings aim to promote collaborative, sustainable solutions among stakeholders to mitigate the impact of water hyacinth and support the coexistence of local communities with their aquatic environment.

Literature Review

The waterways of the Niger Delta, including Kugbo Creek, are visibly invaded by the foreign aquatic weed, water hyacinth (*Pontederia crassipes*), previously classified as *Eichhornia crassipes* (Basilio & Buot, 2023). This

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invasive species has displaced the previously dominant and comparatively less harmful native vegetation. A comprehensive scientific investigation is necessary to fully assess its impact on the local ecosystem and the socio-economic livelihood of affected communities and document the associated vocabulary. According to Nguyen et al. (2015), the habitat suitability of water hyacinth and its interactions with ecological communities remain largely understudied in tropical reservoirs. Villamagna (2009) notes that the strong interdependence among biological communities in aquatic ecosystems complicates predictions of non-native species' impacts without a thorough understanding of the existing system and how the introduced species affect various ecosystem components.

Nyananyo (2006) describes the native species *Pistia stratiotes*, commonly known as water lettuce or Nile cabbage, as a free-floating aquatic plant that is rarely anchored by its roots and often displaced by the wind. However, the aggressive proliferation of water hyacinth has disrupted fish populations and rendered sections of the creeks impassable, threatening indigenous fishing practices and reducing fish catches. Edoghotu, George and Hart (2016) highlight critical threats to fisheries in the Niger Delta, including habitat loss, invasive species, parasitic infections, and diseases, most of which are anthropogenic. Similarly, Ndinwa et al. (2021) observe that the persistent spread of water hyacinth in delta regions of Nigeria causes obstructions in electricity generation, irrigation, navigation, and fishing. Their study further reveals that infestation accelerates water loss through evapotranspiration and promotes the spread of diseases such as bilharzia. The situation mirrors similar experiences across Africa. For instance, *Business Daily* (December 25, 2020) reports that water hyacinth in Lake Victoria creates an ideal habitat for snails carrying bilharzia-causing parasites, increasing health risks for local fishermen. In addition to disrupting fishing activities, the invasive weed exposes fishermen to infection, as they manually remove it without protective gear.

Recent advancements in artificial intelligence (AI) present promising solutions for documenting and preserving linguistic data in marine environments. AI tools, including machine learning, natural language processing (NLP), and speech recognition, can automate data collection, linguistic analysis, and transcription, thereby enhancing the documentation of endangered languages. AI-driven research agents have been developed to streamline linguistic workflows, refining corpus annotators to handle specialized research tasks. Furthermore, AI techniques for marine data analysis support ecosystem monitoring and optimize resource management. By harnessing AI tools to document Abureni vocabulary related to water hyacinth infestation in Kugbo Creek, this study seeks to preserve linguistic heritage while providing actionable insights for ecological intervention. This interdisciplinary approach underscores AI's transformative role in bridging linguistics and environmental studies, amplifying indigenous perspectives on ecological challenges.

Theoretical Framework

This study adopts Social Constructivism, a perspective which suggests that knowledge is built through social interactions and shared experiences, rather than discovered independently (Vygotsky, 1978). This means that the way people describe and understand environmental changes, like water hyacinth infestation, is shaped by conversations, cultural traditions, and collective knowledge. The Abureni people have developed their own terms to talk about water hyacinth in Kugbo Creek, reflecting their lived experiences and ecological challenges. Water hyacinth (*Pontederia crassipes*) spreads rapidly, blocking waterways, making fishing harder, and disrupting local transportation (Ndinwa et al., 2021). But beyond its ecological effects, this invasive plant has also influenced local language, as communities create terms to describe its presence and impact. Vygotsky (1978) emphasized that learning and understanding develop through interaction. It means that native speakers' indigenous expressions related to water hyacinth infestation are part of a socially constructed knowledge system shaped by everyday discussions, environmental observations, and community awareness. Expanding on this perspective, Lantolf & Poehner (2014) argue that language is constantly evolving and shaped by social engagement. They suggest that meaning is not fixed but negotiated through human interactions and environmental influences. In documenting Abureni terminology, this study highlights how language adapts over time, demonstrating that the vocabulary used to describe water hyacinth infestation reflects broader cultural and ecological shifts.

Artificial intelligence (AI), particularly natural language processing (NLP), plays a key role in preserving these evolving linguistic expressions. AI tools can transcribe, analyse, and detect shifts in vocabulary, helping researchers understand the ways communities describe and interpret environmental challenges. However, as constructivist theory suggests, knowledge cannot be reduced to raw data; rather, it must be validated through direct engagement with native speakers. This ensures that AI does not just record words but captures their deeper meanings, allowing Abureni voices to remain central in the ethnolinguistic knowledge preservation that this study aims to achieve. By bridging technology, community perspectives, and language, this study highlights that knowledge is an ongoing, evolving process shaped by real-world experiences. Preserving Abureni vocabulary through AI safeguards both cultural identity and environmental awareness, ensuring that local knowledge remains valuable for future generations.

Methodology

This study integrated linguistic fieldwork and AI-driven computational techniques to document and analyse Abureni vocabulary related to water hyacinth. It gathered data through semi-structured interviews and focus group discussions with selected native Abureni speakers. The respondents included elders and youth across gender population, boat operators, farmers, fishermen, timber transporters, ferrymen, and travellers who possess ecological awareness and lived experience on water hyacinth infestation of their waterways. These interactions were supported by participant observation, which helped capture natural expressions and locally meaningful language during storytelling, group activities, and interactions with the environment. The study phonemically transcribed the audio and video recordings from the field, using the Unicode-Latin IPA (SIL) keyboard to capture detailed pronunciations and tones as Abureni is a tone language. The customized Nigeria underline keyboard was also used to generate orthographic representations that reflect Abureni tone and sub-dot conventions. To ensure accuracy, the author worked closely with native speakers to review the data and confirm that the meanings were true to the Abureni language. The study made use of AI tools, especially Microsoft Copilot, to help group vocabulary by theme, analyze word structures, and create bilingual glosses that reflect the cultural context. It also used Natural Language Processing (NLP) methods such as sentiment analysis, metaphor detection, and tracking of word trends to better understand how water hyacinth infestation is emotionally expressed in Abureni speech. Reflecting on how digital tools shape language, Patel and Jain (2019) note that AI models anticipate how words form, NLP examines sentence structure, and that semantic web technologies help reveal meaning in text. In addition, the study used geospatial tools like Google Earth Pro and geotagged field images to link indigenous place-names to actual locations along the waterways. Together, these digital tools and computational methods made it easier to spot patterns in how Abureni communities talk about environmental disruptions. Furthermore, the study compared the linguistic data with ecological reports and scientific studies on water hyacinth in the Niger Delta. The intent was to check both similarities and differences between indigenous ecological terms and formal environmental accounts. In addition, public ecological classification systems helped align Abureni language categories with widely accepted biological concepts.

Data

This section presents vocabulary related to water hyacinth (*Pontederia crassipes*), organized into categories that reflect its ecological, socio-economic, and cultural impacts. The terms include expressions commonly used by native speakers to describe different aspects of the plant and its effects, along with AI-generated words related to water hyacinth translated into Abureni. Where appropriate, examples are provided to illustrate the specific relevance of certain terms to the water hyacinth infestation in Kugbo Creek.

Taxonomy of Water Hyacinth

Kingdom: Plantae – Fundamental plant classification

1. imitiān oriren → [imítíán órírén] ‘plant classification’

Elegh imitiān oriren

‘Sign marking the botanical classification of a plant.’

Clade: Angiosperms – Identifies as a flowering plant with enclosed seeds.

2. Oriren ạlele → [òrírén ạ́lèlè] ‘flowering plant’

Oriren ạlele ọlā nā amum itu yā ikpo ọdī dā ologi

‘A flowering plant that bears fruits containing enclosed seeds.’

Order: Commelinales – Establishes botanical lineage.

3. Ọdudul imitiān → [òdūdūl imítíán] ‘history about lineage’

Ọdudul imitiān oriren

‘Historical classification of a plant’s lineage.’

Family: *Pontederiaceae* – Defines taxonomic grouping of water hyacinth.

4. Eghun → [èḡùn] ‘family’

Eghun ọkarabh opopobh

‘Taxonomic grouping of the water hyacinth within the family Pontederiaceae.’

Genus: *Pontederia* – Distinguishes from other aquatic plants.

5. Elegh anwegian ipan ighogho → [èlèy ǎnʷègiǎn ípǎn íyóyò] ‘distinguishing sign from other weeds’

Elegh anwegian ipan ighogho ya na esu da amum
‘Marker distinguishing it from other aquatic plant species.’

Species: *Pontederia crassipes* – Precise identification of water hyacinth.

6. Agai elegh okarabh opopobh → [ǎgièlèy ókáráb ópópòβ] ‘*True classification of water hyacinth*’

Onon agai elegh okarabh opopobh
‘This is the real identity of the water hyacinth, locally referred to as ‘bad water lettuce’, reflecting its displacement of native aquatic plants.’



Figure 1 A section of Kugbo Creek infested by water hyacinth
(Photo by Dan Etire, 2016)

Invasive Growth and Adaptations of Water Hyacinth

Growth: The process by which water hyacinth increases in size and biomass, often doubling within weeks under optimal conditions.

7. Alusu → [ǎlòsò] ‘growth’

Okarabh opopobh na asu gudugudu ma ekudi obhel
‘Water hyacinth grows rapidly, increasing in size within a short period of time.’

Clustering Pattern: Dense mats of water hyacinth can block waterways, impeding flow and navigation.

8. Qsu okpolan → [ǎsò ókpòlǎn] ‘to grow and cluster’

Okarabh opopobh na asu na akpolan
‘Water hyacinth grows and clusters densely.’

Roots and Siltation: The extensive root system traps silt, leading to sediment buildup in waterways.

9. Ikika bhò na oḅalamenì arìbhiiy → [íkìkà βó nè òḅèlèmèni òβiíy] ‘roots and siltation’

Ikika okarabh opopobh na esu na esor da ade amum sa na adighi ma ola obhiiy na abala,
‘Water hyacinth roots grow deep, causing rivers to become silted.’

Flowering: The production of lavender to pink flowers, typically in clusters throughout the year.

10. Qza omutioghom ralele → [òmùtiòyòhm rǎlèlè] ‘flowering fine’

Na aza na amutioghom ibebi ralele kigiel kigiel da emu ala, akozogh na adigho
‘Water hyacinth flowers throughout the year in both dry and rainy seasons.’

Spread: Water hyacinth proliferates rapidly via seeds and vegetative reproduction

11. Qsu osasaragian → [ǎsò ósàsàràgiǎn] ‘to grow and spread’

Okarabh opopobh na asu ma eweghe eweghe da anyu amum na amaragian na amuzoghodi
‘Water hyacinth spreads horizontally on water surfaces and reproduces rapidly.’

Lifespan: Water hyacinth can live 1 to 2 years, with seeds remaining viable for up to 28 years (Gupta & Yadav, 2020).

12. Qnu ala aghudum → [ǎnò ǎlá éyúǎdúm] ‘life span’

Okarabh opopobh na adum aguṣ iwāl ala, sa ikpo bhṣ na erṣ tutun adusubh na obhabhanya ala.
'Water hyacinth can live up to two years, with its seeds remaining viable for twenty-eight years.'

Edibility: Young leaves and stems of water hyacinth can be consumed after cooking but may cause itching.

13. *Qsa ode* → [ṣà ódè] 'to cook and eat' (edibility)

Ta orue osa ma imunumun bhṣ ode, yaa na aruom adobhian da aruzu idi ogbo
'The young leaves can be cooked and eaten, but they may cause itching in some individuals.'

Ecological Terms

Aquatic Weed: Plants that grow in water and can become problematic when they overpopulate.

14. *Qghoghṣ ola na asu da amum* → [ṣṣṣṣ ól ná ásó dá ámôm] 'grass that grows on water'

Igiel isu imaragian ipu sa iten aligam aruzu
'They become problematic when they grow and multiply indiscriminately.'

Biodiversity loss: The decline of native aquatic species due to the dominance of water hyacinth.

15. *Qbhughuḍi* → [ṣṣṣṣ ṣṣṣṣ] 'to choke,' describing how water hyacinth overwhelms native plants

Okarabh opopobh abhughuḍi ma igbainy ighoghṣ ya na esu da amum da ebhugh
'Water hyacinth suffocates native aquatic grasses, leading to biodiversity decline.'

Extinction of Species: The loss of biodiversity in a particular habitat.

16. *Okunugi* → [òkúnúḡi] 'to cause to become extinct.'

Okarabh opopobh abhughuḍi ma igbainy ighoghṣ ya na esu da amum da ebhugh
'Water hyacinth suffocates native aquatic grasses, leading to biodiversity decline.'



Figure 2 A native aquatic weed, water lettuce (*Pistia stratiotes*)
Photo by Ito Gabriel, 2024 (Produced by permission)

Note: Water hyacinth (*Pontederia crassipes*) is locally known to have displaced the native species commonly referred to as water lettuce (*Pistia stratiotes*).

Ecosystem Imbalance: The disruption of a natural system due to invasive species.

17. *Onwegi* → [ònʷèḡi] 'to cause to change' (pl)

Okarabh opopobh na anwegi ma aguṣ idiar ebhugh oḍi
'Water hyacinth disrupts the ecological balance of the region.'

Eutrophication: The process by which water bodies become nutrient-rich, often aiding the rapid growth of plants like water hyacinth.

18. *Ighoghṣ ma onur osu da obhiy* → [iḡṣṣṣ mà òsò dá ámóm íbōm] 'rapid growth of water weed'

Idiar oḍi ma ya na edighi ma ola ighoghṣ ya na esu da amum na enur na esu da obhiy
'Nutrient-rich water bodies accelerate the uncontrolled growth of invasive weeds like water hyacinth.'

Habitat Disruption: The disturbance or destruction of the natural environment where organisms live.

19. *Opiegi* → [òpìèḡi] 'to spoil' (pl)

Okarabh opopobh na apięgi ma aguę idjar ya inwuna ma aghudum da ebhugh
'Water hyacinth alters the natural habitat, disrupting life forms in the ecosystem.'

Infestation: The presence of an unusually large number of insects or animals in a place, typically causing damage or disease.

20. Na ebhin ade → [nā éβin ádè] 'they have taken over the land'
21. Na ebhin obhiiy → [nā éβin òβííj] 'they have taken over the river (waterway)'

Okarabh opopobh na abhin obhiiy bho
'Water hyacinth has infested the waterway'

Invasive Species: Non-native plants or animals that spread rapidly and cause harm to the environment, economy, or human health. (Harun et al., 2021)

22. Opięgięgi → [òpíęgíęgí] 'spoiler'

Okarabh opopobh obom oęięgięgi da aribhiiy Abureni na ipan arisi ya okua
'Water hyacinth causes severe harm in Abureni water ways and similar inland waterways.'

23. Okunugikunugi → [òkùnùgíkúnùgí] 'destroyer'

Okarabh opopobh obom okunugikunugi!
'Water hyacinth is a destructive invasive species!'

Disruptive species: Non-native organisms that spread rapidly and disrupt ecosystems.

24. Ighoghę ipan ebhugh → [íyóyó ípán éβúy] 'grasses from other regions'

Ighoghę ya idua da ipan rebhugh na ra ekunugi ma iya ebhugh bho
'Invasive species that disrupt or destroy local species.'

Oxygen depletion: A consequence of water hyacinth mats blocking sunlight and air, reducing oxygen levels in water.

25. Na akigima ma ebalabal na obhubhulom → [nā àkígímā mā ébálábál nā òβùβùlòm] 'blocked light/air'

Okarabh opopobh na akigima ma amum da obhiiy oęi ebalabal ogogo na obhubhulom
'Water hyacinth blocks sunlight and oxygen from reaching water surfaces, depleting oxygen levels in waterways.'

Socio-Economic Terms

Economic burden: The cost of managing and controlling water hyacinth infestations.

26. Adol apuru ma okpoki → [ádòl àpúró má ókpòkí] 'burden and monetary cost,' emphasizing the financial strain.

Ogir osighegi ipopobh da aribhiiy obom adol. Na apuru ma okpoki.
'Removing water hyacinth from the infested water ways is a great burden. It demands monetary resources.'

Indigenous Knowledge: The traditional knowledge held by indigenous peoples about their local environment and practices.

27. Eloghom abar ade ęma → [élóyòm ábár ádé ęmà] 'native knowledge'

Anwunom Abureni eloghom aguę aribhiiy dawa iro kisa okarabh opopobh aru. Işen esi ogbi igheleghel bo, esi ina ta ebhogh sa urobh mu ma isobh ebula okua. Esi ogim akasa bo. Esi okpo ogbo, bodo orobh ogbo bo nyen!

'Abureni people know the state of their waterways before the infestation of water hyacinth. Now, there is neither a place to set closed-basket fishing gears, nor is there a place for fish to swim to surface (hop in and out of water) making it impossible for spearfishing. No place to set a net or cast a net!'



Figure 3 A flinging type fishing hook line in water hyacinth
(Photo by Dan Etire, 2015)

Livelihood disruption: The impact on traditional occupations like fishing and farming.

28. *osobh edogh* → [òsòβ é d̥ɔ̃y] ‘cut-throat’, an idiomatic expression for the disruption of livelihood.

Odi oze ma ina agba ma, okarabh opopobh na asobh edogh doyo (asidogh). Yagai, na osobh do ma edogh doyo kukum, asobhi ma redogh adizo ogbo da ebhugh bh.

‘A certain fisherman lamented that water hyacinth has ‘cut his throat.’ Indeed, it has devastated the livelihoods of many people in the area.’

Navigation Obstruction and hinderance: Waterway blockages hinder fishing and make it difficult for dug-out canoes and out-board engine driven boats to pass through.

29. *Okpolan kpa* → [òkpòlàn k̥pám] ‘cluster heavily,’ describing water hyacinth’s dense matting.

Ipopobh na ekpolan da obhiy na egbanameni ma arughugh

‘Water hyacinth has densely clustered, obstructing boats and water ways.’



Figure 4 Two women arduously paddling a canoe-load
of farm produce through water hyacinth mat
(Photo by Dan Etire, 2017)

30. *Obhiy bo* → [òβĩj b̥ɔ̃] ‘no river’ or ‘no waterway’ meaning ‘There is no river anymore!’ This expression is frequently used by affected community members to voice their frustration.
31. *Ukpa* → [ókpā] ‘A thick, entangled mat of invasive aquatic weeds, such as water reed, water lettuce, hyacinth, or similar species.’
32. *Qdom ipopobh* → [òd̥óm ípòpòβ] ‘paddling on hyacinth,’ This phrase refers to the arduous journey of paddling a dugout canoe through waters choked by a thick mat of invasive hyacinth.

Socio-economic Impact: The broader effect of water hyacinth infestations on the social and economic well-being of impacted communities.

33. *Itotogi na roloko* → [itótógi nè ròlókó] ‘Regulations standards and procedures’

Roloko na itotogi osighegi ipopobh ta elogh aguo na enigha ma rema ya odi da arihbhiy bh.
Aguo otuom, anwunom ko ogaga do emur ighogh oze ipopobh, sa ina na inam ta ewol ise emugughu.

‘Regulatory standards for managing water hyacinth will benefit affected communities. For example, they can prevent indiscriminate herbicide use, which harms aquatic life.’

Sustainable Management

Sustainable management involves methods that prevent resource depletion and environmental harm, ensuring long-term ecological balance.

34. Agì na eḅh → [àgì nà éḅḅ] ‘it should go quietly or peaceably’ (figurative).

Odighi aguḡ olà okarabh opopobh tḗ akun, sa idiar ya odi ḡa aribhiiy bhḡ ko opian ḡo.

‘Water hyacinth should be controlled through a method that neither creates harm nor imbalance in the water bodies.’

Water Quality Degradation

Water quality declines due to pollution and other factors, including the impact of invasive aquatic plants like water hyacinth (*Pontederia crassipes*).

35. Ogbudumēni amum → [òghòdòmèni àmóm] ‘to degrade water,’ describing the deterioration of water quality.

Okarabh opopobh na agbudumēni ma amum ḡa adizo rekā. Aguḡ otuom, osobhom itaghatagh na ogbudu.

‘Water hyacinth causes the quality of water to decline from various ways. For example, trapping of debris and siltation of infested water bodies.’ (Uwadiae, Daudu, & Lawal, 2021).

Cultural and Indigenous Terms

Ethnolinguistic Expressions Related to Water Hyacinth Infestation:

This collection of words and phrases reflects the cultural significance of water bodies affected by water hyacinth (*Pontederia crassipes*).

Inyen idi arunokpe ya igboloma Okarabh opopobh

‘These are some words or phrases about water hyacinth infestation.’

36. okpolan → [òkḡpòlàn] ‘to cluster,’ describing the plant's tendency to form dense mats.
 37. kpām → [kḡpām], an ideophonic expression conveying a tightly knit, intertwined mass.
 38. obhin [òḃin] ‘to take’ (infest), emphasizing its aggressive spread.
 39. ḡsam → [ḡsām] ‘to clear,’ referring to efforts to remove the invasive species.
 40. obhunugi → [òḃùnùgì] ‘to offload to dry land,’ illustrating removal and disposal methods.
 41. osobhom → [òsòbhòm] ‘to obstruct,’ highlighting its interference with water navigation.
 42. ḡtama → [ḡtāmà] ‘to float freely,’ describing its movement on water surfaces.
 43. ḡtamamēni → [ḡtāmàmèni] ‘to cause to float along with water current,’ showing its passive transport by flowing water, especially when guided.
 44. ozoghū ipopobh → [òzòghù ípòpòḃ] ‘to paddle on water hyacinth or water lettuce,’ depicting the reality of navigating through infested waters.

Local Names for Water Hyacinth (*Pontederia crassipes*)

Indigenous communities use distinct terms to describe water hyacinth, reflecting its ecological impact and cultural significance.

45. Okarabh opopobh → [òkàràḃ ópòpòḃ] ‘bad water lettuce’ literally.
 46. Abiola → [àbíólá] ‘code-name of water hyacinth’

These expressions highlight the plant’s status as an invasive species that has displaced *Pistia stratiotes* (water lettuce), which is regarded as native and less harmful by the communities living along the infested Kugbo Creek. Among Kugbo people and other riverine communities in Rivers State and Bayelsa State of Nigeria, water hyacinth is referred to as “Abiola grass” or simply “Abiola.” This name metaphorically likens the plant’s rapid proliferation to the generosity of Chief M.K.O. Abiola, a Nigerian philanthropist and politician who was widely believed to have won the annulled presidential election of 1993. Different names are given to *Pontederia crassipes* in other regions or countries. For example, Rojas-Sandoval and Acevedo-Rodriguez (2013) identified several international and local common names for the invasive aquatic weed water hyacinth as follows:

“English: lilac devil; water orchid; water violet

Jamaica: water lily

Philippines: water lily

South Africa: Florida devil; lilac devil

USA: river raft” (Rojas-Sandoval & Acevedo-Rodriguez, 2013, para. 5 & 6).

Control Methods

Biological Control: the use of natural predators or diseases to manage invasive species.

47. Ighoghò obhughudì opopobh → [ìyóyṓ óbóyóúdí ópòpòβ]

Ighoghò yà nà mà ipopobh oḍi

‘There are weeds that grow and choke water hyacinth.’

Chemical Control: the use of herbicides or other chemicals to control invasive plant species.

48. Omur ighoghò → [òmùr ìyóyṓ] ‘to spray herbicide’

Idi anwunom nà emur idi aḍien ighoghò nà eze mà ipopobh.

‘Some people use certain herbicides to spray on and kill water hyacinth.’

Manual Removal: the process of physically removing invasive plants from an area.

49. osam ipopobh → [òsàm ípòpòβ] ‘to clear water lettuce or water hyacinth’

Osam ipopobh owele kukum nà esu ebhin obhiy!

‘No sooner is the water hyacinth cleared from a waterway than it grows and infests it!’

50. Isam mà ipopobh → [ìsàm mà ípòpòβ] ‘water hyacinth clearers (manual workers)’

51. Okele osam ipopobh [òkélé ósàm ípòpòβ] ‘local announcement for clearing water hyacinth’ (usually using a gong by a town crier)

Removal to dry land: A traditional method used by the Abureni people to control water hyacinth infestations in inland waterways. This process involves manually extracting the invasive plants from the river and placing them on land, where they gradually wither and die due to the lack of water.

52. osam obhunugi → [òsàm óbùnùgi] ‘to cut and offload to land’

Osam ipopobh obhunugi da egbolom

‘Manually extracting the invasive plants from the river and depositing them on land’

Hyacinth Drag Hook: A specialized tool traditionally used by the Abureni people to facilitate the removal of water hyacinth. This tool is known as:

53. okom mà ipopobh → [òkò mà ípòpòβ] ‘hyacinth drag hook’

Owewegh oriren ola anwuna mà ekalam ola nà obhin nà okomogi mà ipopobh da Abureni.

‘A long pole with an angled end, locally used as a weed puller in Abureni.’

Rafting to saline waters: A traditional method used by the Abureni people to control water hyacinth infestations in inland waterways. This process involves manually removing the invasive plants from freshwater sites and guiding them downstream into saline waters, where their ability to thrive and spread is significantly reduced.

54. Osam otamamenì → [òsàm ótàmàmèni] ‘to clear and allowed to float away.’

Oḍi aguṣ osighegi ipopobh da obhiy bhà osam otamamenì ka oḍighom da abadi.

‘One method of removing water hyacinth from a river is to clear and guide it into the ocean.’

Fauna Attracted to Water Hyacinth

Bird Species: Certain bird species, such as the water hyacinth bird, are attracted to the dense mats of water hyacinth for nesting and feeding. (Basaula et al., 2021)

55. Asabi ipopobh → [àsábí ípòpòβ] ‘water hyacinth bird’



Figure 5 A species of water hyacinth bird perched on hyacinth plant

*at Amurukeni – Kolo waterway along Kugbo Creek
(Photo by Dan Etire, 2015)*

Abureni vocabulary on water hyacinth extends to folktales as illustrated in the fable relationship between the water hyacinth bird and the catfish below:

Asabi ipopobh agba maa, igbirigbir opopobh bo nabo maa, ina na azer emu ta orughobhiiy atutughudi. Ina ta orue do ma ozer opopobh odineni, okua ka ina ta adighi eka agi ka azer orughobhiiy wa odi da gde amum bhq? Onon odi asidogh ola Abureni agboloma ma ibom afugh.

Translation: According to an Abureni folktale idiom, the water hyacinth claimed that, if it was not for the sympathy he had for water hyacinth, it would have marched catfish's head and crushed it. The irony is that it has not been to sink water hyacinth it steps on, talk less of reaching catfish at the depth of the river. What a bogus claim!

Beetles: The mottled water hyacinth weevil (*Neochetina eichhorniae*) and the chevroned water hyacinth weevil (*Neochetina bruchi*) are beetles introduced as biological control agents to manage water hyacinth infestations. (Bick et al., 2020; Gore et al, 2020)

- 56. Okpakpagh → [òkpàkpǎy] 'beetle' generally
- 57. Ebulegunweiny → [ébùlégúnwéɪn] 'water hyacinth weevil'
- 58. Anī ipata → [ánī ípátá] 'species of freshwater beetle' (large species)
- 59. Anī upetupe → [ánī úpétúpè] 'species of freshwater beetle' (small species)

Other Fauna: Gastropods, annelids, and various invertebrates are commonly found associated with water hyacinth roots. (Kelemu, Egborge, & Ekokotu, 1990)

- 60. a) Ekpariom → [èkpàríòm] 'freshwater snail'
- b) Ama ekpariom → [ámá èkpàríòm] 'freshwater snail' (giant species)
- c) Enyim ekpariom → [ámá èkpàríòm] 'freshwater snail' (dwarf species)

Data Analysis and Findings

In this section, the study presents three distinct tables to deepen the analysis and enhance understanding of the data. These tables highlight ethnolinguistic significance, environmental and socio-economic impact, and emotional diversity among the various speaker groups interviewed. To achieve these, the study applied the sentiment analysis, metaphor detection, and word trend tracking features of the Natural Language Processing (NLP) and semantic web technologies to examine sentence structures and uncover meaning within texts. These methods, allowed for meaningful comparisons with indigenous knowledge systems. They also facilitated the identification of linguistic patterns in how Abureni people discuss environmental disruptions caused by water hyacinth infestation. Additionally in this section, the study highlights the AI-based method used to decode Remote Sensing (RS) imagery of affected areas in the Kugbo Creek. This was achieved using Google Earth Engine (GEE), an object-based platform, to access and analyze digital aerial photographs of water hyacinth-infested sections, including historical images in the repository.

Ethnolinguistic Significance – Groups with Distinct Cultural Expressions

This table highlights speaker groups that employ culturally significant vocabulary to describe their interaction with water hyacinth.

Table 1: Ethnolinguistic expressions of water hyacinth: Perspectives from Speaker Groups

Speaker Group	Frequently Used Words/Phrases	Meaning
Elders	<i>Na apje ma obhiiy!</i> 'The plant has spoiled (devastated) the river!'	Expresses deep environmental concern about the infestation.
Fishermen	<i>Na akpegi kesikesi!</i> 'Everywhere is covered/blocked!'	Highlights frustration over waterways clogged by hyacinth.
Boat operators	<i>Aguo omin ighor bo!</i> 'It is choking us!'	Shows anger due to navigation obstructions caused by the plant.
Local ferry operators	<i>Omutiom opān aguo obhin obei obhiiy!</i> 'We need alternative crossings!'	Calls for infrastructural solutions to ensure safer transport.

Speaker Group	Frequently Used Words/Phrases	Meaning
Boat transporters	<i>Iyar ogi ogi!</i> 'We keep moving, no matter the situation!'	Demonstrates resilience despite challenges posed by water hyacinth.
Swimmers & Divers	<i>Esi odin amum bo!</i> 'No more diving spots!'	Expresses disappointment over lost recreational spaces.
Lumbers (floating timbers)	<i>Igieḍi abhon apu!</i> 'It was easier before now!'	Reflects nostalgia for better conditions before the infestation.
Traditional (older) farmers	<i>Ta obhoroḡh opān aguḡ ogir!</i> 'We shall find another way!'	Indicates adaptation strategies for navigating restricted waterways.
Traditional farmers	<i>Kaḡama kaḡama imom imom!</i> 'Something new every day!'	Conveys resignation in response to ongoing environmental disruptions.
Youth	<i>Onon opān aḡdien opopobh!</i> 'Just another marine grass.'	Demonstrates indifference, viewing hyacinth as just another plant.
Modern (younger) farmers	<i>Kaḡin ta orue obhin ogir abar!</i> 'Maybe we can use it!'	Suggests hope in exploring agricultural applications for the plant.
Travellers from other communities	<i>Aziba aḡighi, na otei anḡ do iyar!</i> 'At least we are spared!'	Express gratitude for clear waterways in their region.

The table above illustrates how Abureni speakers utilise their language to document environmental realities. This linguistic expression serves as an essential ethnolinguistic tool for preserving vocabulary that has emerged in response to the impact of water hyacinth.

Table 2: Socio-Economic Impact of Water Hyacinth: Challenges and Adaptations Across Speaker Groups

Speaker Group	Interaction with Water Hyacinth	Effect	The
Fishermen	Struggle with blocked waterways affecting their livelihoods.	Reduced fishing opportunities and income.	
Boat operators	Face obstructions in waterways due to infestation.	Delays, damage to equipment, increased operational costs.	
Local ferry operators	Navigate water hyacinth-infested waterways.	Safety risks and loss of passengers.	
Boat transporters	Persist despite navigation challenges.	Increased difficulty in transporting goods and passengers.	
Swimmers & Divers	Struggle with deteriorating recreational spaces.	Loss of safe swimming and diving spots.	
Lumbers (floating timbers)	Adjust to changing water conditions affecting transport.	Increased difficulties in timber transportation.	
Traditional (older) farmers	Adjust to navigation difficulties using dug-out canoes.	Longer travel routes, higher labour efforts.	
Traditional farmers	Weary of environmental disruptions.	Increased challenges in sustainable farming practices.	
Modern (younger) farmers	Explore agricultural benefits of water hyacinth.	Research into composting, fodder, and biofuel applications.	
Community Development Committee (CDC)	Mobilize inhabitants for periodic clearing efforts.	Organizes solutions for waterway maintenance.	
Commercial businessmen	Engage in inter-community trading and exportation of farm produce.	Trade routes affected, economic uncertainty.	
Indigenous Travelers/Passengers	Regularly navigate water hyacinth-infested waterways.	Increased travel time, occasional safety concerns.	

infestation of water hyacinth affects various speaker groups in distinct ways, shaping their emotional responses and adaptive strategies. Table 2 categorises these responses based on intensity, ranging from strong emotions such as anger, frustration, and fear, to hope, adaptation, and gratitude.

As illustrated in Table 2, the study examines how various groups interact with and respond to the presence of water hyacinth. This analysis provides valuable insight into its broader socio-economic implications, shaping discussions on sustainable solutions and policy interventions. The findings offer useful perspectives for stakeholders involved in research, ecological policy-making, and efforts to mitigate the infestation's impact.

Emotional Diversity – Ordering Groups by Strongest to Mildest Emotional Reactions

The infestation of water hyacinth along Kugbo Creek has significantly shaped the emotional responses of affected speaker groups, reflecting the challenges they face in their livelihoods, daily activities, and cultural experiences. The intensity of these emotions differs, with some groups expressing anger, frustration, and fear, while others demonstrate hope, adaptation, or gratitude in response to the environmental disruption.

Table 3: Emotional Responses to Water Hyacinth Infestation: Perspectives from Speaker Groups in Communities along Kugbo Creek.

Speaker Group	Emotional Keywords	Reasoning
Elders	Fear	Concerned about waterway degradation affecting future generations.
Fishermen	Frustration	Struggle with blocked fishing areas and loss of livelihood.
Boat operators	Anger	Navigation difficulties and financial setbacks.
Local ferry operators	Concern	Worry over safety and access issues for passengers.
Boat transporters	Resilience	Determined to keep operating despite difficulties.
Swimmers & Divers	Disappointment	Loss of natural recreational spaces.
Lumbers (floating timbers)	Nostalgia	Reflect on easier times before infestation.
Traditional (older) farmers	Adaptation	Find alternative ways to cope.
Traditional farmers	Resignation	Accept constant environmental challenges.
Youth	Indifference	Unconcerned by the plant's presence.
Modern (younger) farmers	Hope	See potential in agricultural applications.
Travelers from other Abureni communities	Gratitude	Relieved that their region's waterways remain clear.

As shown in Table 3, these emotional perspectives provide valuable insight into how communities along Kugbo Creek perceive and cope with ecological challenges. Additionally, these findings hold relevance for similarly impacted communities, contributing to broader linguistic and anthropological discussions that help stakeholders understand the socio-economic and cultural implications of water hyacinth infestations across affected regions. Furthermore, the study blended spatial imagery with ethnolinguistic documentation to preserve cultural knowledge through visual representation as highlighted in the Figure 5 below.



Figure 6 “Kugbo Creek crossing along Emago - Ogbia Road, near the estuary of Otibe Creek: water hyacinth and timber rafts.” 4°41'35.42" N and 6°27'13.14" E. Google Earth. March 3, 2013. October 28, 2020. (annotated)

Figure 5 presents an annotated satellite image of the Kugbo Creek crossing along the Emago–Ogbia Road, captured via Google Earth on 3rd March 2013. The location sits near the Otibe Creek estuary - an area heavily infested by water hyacinth, which often chokes timber-laden canoe pathways. As such, the image serves not only as an ecological reference but also as a geographic anchor for terms commonly found in everyday Abureni vocabulary. The annotations were added to highlight features that resonate with the lived experiences and linguistic patterns of the local people. This offers an enriched understanding of both environmental and cultural

dimensions. Supporting this integrative method, Yang et al. (2022) affirm the utility of AI-based techniques for decoding Remote Sensing (RS) imagery. When deployed through object-based platforms like Google Earth Engine (GEE), such approaches closely align with community-driven language mapping efforts, thereby bridging modern geospatial analysis with indigenous knowledge systems.

Conclusion

The persistent spread of water hyacinth in the Niger Delta's inland waterways continues to threaten local ecosystems and disrupt traditional livelihoods in communities along Kugbo Creek. Fishing, canoe transport, lumbering, farming, and ferry operations, all central to daily life and economic sustenance, are increasingly challenged by this invasive plant. This research employed Artificial Intelligence, with an emphasis on using relevant features of Natural Language Processing (NLP), to document and analyze Abureni vocabulary related to the water hyacinth infestation. The goal was twofold: to protect and preserve the linguistic heritage of the Abureni people, and to generate meaningful ecological insights that could guide future interventions. The study notes that AI offers a transformative bridge between language documentation and environmental analysis, enabling indigenous expressions and ecological observations to inform each other. For example, by aligning modern geospatial tools with community-driven language practices, it amplifies local knowledge and centers ethnolinguistic voices in environmental discourse. Beyond highlighting the severe ecological impact of water hyacinth, this interdisciplinary effort reveals how the phenomenon has influenced the Abureni linguistic landscape. This is reflected in the emergence of vocabulary shaped among the people by their lived encounters with the plant. This connection between environmental change and language use underscores the importance of integrating ethnolinguistic data into ecological studies. Specifically, the study demonstrates how AI can support culturally grounded responses to ecological crises and calls for collaborative, sustainable action among stakeholders. Preserving language, protecting ecosystems, and empowering indigenous communities are not separate goals but they are deeply interwoven threads of the same story unfolding along Kugbo Creek.

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