

Chapter

The Impacts of Introduced Fish and Aquatic Macrophytes on the Ecology and Fishery Potential of Lake Victoria, Kenya

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Abstract

Fish have been deliberately introduced into new ecosystems as a management tool, to argument overfished native stocks, to occupy vacant niches, and to create lucrative commercial fisheries. Lake Victoria has witnessed successful introductions of predatory Nile perch, *Lates niloticus* and four Tilapiine species (including Nile tilapia, *Oreochromis niloticus*, *Tilapia zillii*, and *Oreochromis leucostictus*). These introductions have negatively and positively impacted the fishery potential and ecology of native fisheries in the lake. The predation of native species by the voracious Nile perch has contributed to decimation and virtual disappearance of over 300 species of Haplochromines. In addition, competition for feeding and breeding areas and interspecific hybridization between exotic *O. niloticus* and the native Tilapiines have also yielded undesirable results such as disappearance of native *Oreochromis esculentus*. The most successful invasive plant introductions have been water hyacinth, *Eichhornia crassipes*, Nile cabbage, *Pistia stratiotes*, and dense waterweed, *Egeria densa*. Proliferation of water hyacinth has led to increased shading and turbidity. The introduced species have manifested more pronounced deleterious effects on the native fisheries and their ecology in Lake Victoria. Therefore, future introductions of new species should be based on sound scientific research in order to minimize their unprecedented impacts in the new ecosystems.

Keywords: introduced species, aquatic ecosystem, macrophytes, ecology, fishery, Lake Victoria

1. Introduction

Lake Victoria, located in the eastern part of Africa, is one of the largest tropical freshwater lakes in the world. It supports a rich ecosystem and plays a vital role in the economies and livelihoods of the riparian countries, including Kenya [1]. Over the years, however, the introduction of non-native fish species and aquatic macrophytes

has had significant impacts on the ecology and fishery potential of Lake Victoria [1, 2]. Species introductions have been used as a fishery management tool globally. This has occurred through intentional and accidental introductions across biogeographic and ecological boundaries [1]. Over 237 species have been introduced in more than 140 countries globally, out of which the African continent has recorded 147 introductions [1]. Kenya has recorded a total 14 fishery introductions. With a total of six fishery introductions, Lake Victoria is the second leading ecosystem in fishery introductions after Lake Naivasha. Currently, the commercial fishery of Lake Victoria (with an annual fishery output of approximately one million tons) is dominated by two non-native species, Nile perch *Lates niloticus*, Nile tilapia *Oreochromis niloticus*, and the native Silver cyprinid *Rastrineobola argentea* [2]. Before the decline and disappearance of native species, Lake Victoria had a diverse multi-species fishery dominated by native Tilapiines, *Oreochromis esculentus*, *Oreochromis leucosticus*, *Oreochromis variabilis*, the African lungfish, more than species of haplochromines [3]. Some species like the African carp, *Labeo victorianus*, however, declined long before the introduction of exotic tilapia and predatory Nile perch due to overfishing and habitat degradation [3]. Other factors contributing to fishery changes in Lake Victoria are nutrient pollution and massive wetland degradation that led to eutrophication. However, remarkable changes in fish biodiversity occurred after the introduction of Nile perch and exotic Tilapiines such as Nile tilapia (*O. niloticus*) whose ecological impact has been widely manifested [3, 4].

The introduction of non-native fish species, particularly the Nile Perch (*Lates niloticus*), in the 1950s, aimed to enhance fisheries and boost economic development in the region. While the introduction initially resulted in a boom in the fishery industry, it has led to numerous ecological consequences. The Nile Perch, a voracious predator, caused a decline in native fish species, leading to a loss of biodiversity and disruption of the natural food web [5]. Several endemic cichlid species, which were crucial for maintaining the ecological balance, have been pushed to the brink of extinction. In addition to the introduction of non-native fish, Lake Victoria has also been invaded by aquatic macrophytes, primarily the Water Hyacinth (*Eichhornia crassipes*). The rapid proliferation of these invasive plants has had severe ecological and socioeconomic implications [6]. Water Hyacinth forms dense mats on the lake's surface, reducing oxygen levels in the water, and blocking sunlight from reaching submerged vegetation. This, in turn, negatively impacts native aquatic plants and leads to the decline of fish populations, as they lose vital habitats and food sources. The impacts of introduced fish and aquatic macrophytes on the fishery potential of Lake Victoria are substantial [7, 8]. Furthermore, the presence of Water Hyacinth has posed significant challenges to fishing activities. The dense mats of this invasive plant clog fishing gear, impede navigation, and hinder access to fishing grounds. Fishermen have to spend more time and effort clearing the waterways, reducing their fishing productivity [9]. Consequently, the overall fishery potential of Lake Victoria has been compromised, leading to economic losses and food security concerns for the surrounding communities. The introduction of non-native fish species, such as the Nile Perch, and the invasion of aquatic macrophytes, particularly Water Hyacinth, have had profound impacts on the ecology and fishery potential of Lake Victoria in Kenya. Efforts to mitigate these impacts and restore the ecological balance of the lake are crucial for ensuring the sustainable use of Lake Victoria's resources and the well-being of the surrounding communities [8, 10]. Comprehensively, based on a systematic literature review, the main objective of this chapter was to explore and determine the impacts of introduced fish and aquatic macrophytes on the ecology and fishery potential of Lake Victoria.

2. Introduced fish species and their impacts on the ecology and fishery potential of Lake Victoria

Lake Victoria is known for its diverse fish species and its significance as a vital fishery resource. The lake is home to numerous native and introduced fish species, each having its own impacts on the lake's ecology and fishery potential [5]. One of the most notable native fish species in Lake Victoria is the Nile perch (*Lates niloticus*). Another important native fish species in the lake is the dagaa (*Rastrineobola argentea*), also known as the silver cyprinid [11]. Dagaa are small pelagic fish that form a critical part of the fishery in Lake Victoria. They are an important food source for humans and are also used as bait for larger fish species. The population dynamics of dagaa are closely linked to the ecological conditions of the lake, such as water quality and the availability of food resources [10, 11]. These introductions have been driven by the desire to diversify fisheries and provide alternative fishing opportunities. However, the presence of non-native fish species can have both positive and negative impacts on the ecosystem. While they may enhance fishery potential by providing new fishing opportunities, they can also compete with native species for resources and potentially disrupt the ecological balance of the lake [2, 5]. Overall, the diverse fish species in Lake Victoria, including both native and introduced species, have complex interactions with the lake's ecology and fishery potential. Understanding these interactions is crucial for sustainable management practices and maintaining the long-term health and productivity of the lake's fishery resources [12].

2.1 The Nile perch, *Lates niloticus*

The introduction of Nile Perch (*Lates niloticus*) to Lake Victoria has had significant impacts on the ecology and fishery potential of the lake. Originally introduced in the 1950s to enhance fisheries and promote economic development, the unintended consequences of this introduction have had far-reaching effects on the ecosystem [4, 5]. One of the most notable impacts of the Nile Perch introduction is the decline in native fish species. As a voracious predator, the Nile Perch feeds on a wide range of fish, including many endemic species that were once abundant in Lake Victoria. This predation pressure has led to a significant reduction in the populations of these native fish, some of which are now critically endangered or have even become extinct. The decline of these species not only disrupts the ecological balance of the lake but also poses a threat to the cultural and biodiversity values associated with them [4]. Furthermore, the introduction of Nile Perch has caused a disruption in the natural food web of Lake Victoria. Native fish species played essential roles in the ecosystem as both predators and prey. Their feeding habits helped control populations of smaller fish and maintained a balance in the lake's biodiversity. With the decline of these native species, the natural food web has been altered, leading to cascading effects on other organisms. This disruption can result in changes in nutrient cycling, phytoplankton dynamics, and overall ecosystem health [6]. The ecological impacts of Nile Perch introduction extend beyond the decline of native fish species. The feeding habits and behavior of the Nile Perch have also affected other aspects of the ecosystem. For instance, Nile Perch feed heavily on zooplankton, which are crucial for controlling algae populations. The reduction in zooplankton abundance due to predation by Nile Perch has resulted in increased algal blooms, leading to eutrophication and a decline in water quality. This has negative implications for other organisms, including fish

and aquatic plants, which rely on clean and well-oxygenated water for survival [13]. In addition to the ecological consequences, the introduction of Nile Perch has had mixed effects on the fishery potential of Lake Victoria. Initially, the introduction resulted in a boom in the fishery industry. The Nile Perch grew rapidly and provided a valuable commercial catch, attracting fishing activities and generating economic benefits for local communities. The export of Nile Perch fillets became a significant source of foreign exchange for the riparian countries [14]. However, over time, the fishery potential of Lake Victoria has faced challenges. The high demand for Nile Perch has led to unsustainable fishing practices, including overfishing and the use of destructive fishing methods. This has put pressure on Nile Perch populations and led to a decline in their abundance. As a result, fish catches have become less predictable, and the fishing industry has become less reliable as a source of income and livelihood for local communities [7]. Furthermore, the dominance of the Nile Perch in the fishery has resulted in a loss of diversity in catch composition. Traditional fish species, which were once abundant and provided food security for local communities, have been overshadowed by the Nile Perch. This has raised concerns about the resilience and long-term sustainability of the fishery, as the overreliance on a single species increases vulnerability to disease outbreaks, environmental changes, and market fluctuations [7, 15, 16]. Other species severely impacted upon by the Nile perch invasion and predation are three catfishes (*Clarias gariepinus*, *Synodontis* spp., and *Schilbe altinialis*) and the African Lungfish (*Protopterus aethiopicus*) [6, 7, 17]. The introduction of Nile Perch to Lake Victoria has had profound impacts on the ecology and fishery potential of the lake. The decline of native fish species, disruption of the natural food web, and alteration of the ecosystem dynamics have altered the ecological balance and biodiversity of the lake. The fishery industry initially benefited from the introduction but is now facing challenges due to overfishing, loss of diversity, and market uncertainties. Balancing the conservation of native species, sustainable fishing practices, and the economic needs of local communities is essential [17, 18].

2.2 Introduced Tilapiines

The introduction of Tilapiines, particularly the Nile tilapia (*Oreochromis niloticus*) and the Nile tilapia hybrids, to Lake Victoria has had significant impacts on the ecology and fishery potential of the lake. In the 1920s, *Oreochromis variabilis* and *O. esculentus* were the main native Tilapiines contributing to the commercial fishery of Lake Victoria. Tilapiines were introduced to Lake Victoria in the 1950s as an additional fishery resource and to provide alternative fishing opportunities [15]. The Nile tilapia, in particular, was known for its adaptability, fast growth, and tolerance to a wide range of environmental conditions. However, the unintended consequences of this introduction have had profound effects on the lake's ecosystem. However, the native tilapia fisheries declined because the species could not stand high levels of overexploitation. As a result, Haplochromines and Silver cyprinid *Rastrineobola argentea* became the main target species. Research has also shown that the introduced stocks of *Tilapia zillii* have contributed to proliferation of free-floating macrophytes such as *Pistia stratiotes* [16]. According to Outa et al. [15], the total haplochromine catches of 650,000 tons accounted for 80% of the total lake catches in 1967. It also prompted the introduction of *L. niloticus* and *O. niloticus* which increased the lake's fish catches fivefold. However due to its advanced competitive strategies, Nile tilapia outcompeted the endemic Tilapiines *O. esculentus* and *O. variabilis* resulting to their

displacement and total disappearance from the lake [8]. As a result of these disappearances, the Nile perch became the main target species in the lake fishery and fishing pressure using illegal gears was meted on the species. The decline of Nile perch populations in Lake Victoria has reportedly contributed to the recovery of some of the cichlids that initially disappeared as a result of its invasion [6]. Nevertheless, the *O. niloticus* contributed to increases in fish landings from the lake providing affordable and quality animal protein sources to the riparian communities [19].

Another notable impact of introduced Tilapiines is the alteration of the trophic structure of the lake. Tilapiines are generalist feeders that consume a variety of food sources, including plankton, algae, and detritus. Their feeding habits and high reproductive rates have resulted in increased competition for resources with native fish species. This has led to changes in the relative abundance and distribution of different fish populations, potentially displacing or reducing the numbers of native species [19, 20]. Moreover, the introduction of Tilapiines has led to changes in the lake's nutrient dynamics. Tilapiines are efficient grazers of algae, and their feeding activities can reduce algal biomass. While this may initially seem beneficial in controlling algal blooms, it can also have unintended consequences. Algae play a vital role in the lake's food web, serving as a food source for zooplankton, which, in turn, are consumed by other fish species. The reduction in algal biomass due to Tilapiine grazing can disrupt the balance of the food web and impact the availability of food for other organisms, potentially leading to cascading effects throughout the ecosystem [17]. Additionally, the introduction of Tilapiines has had mixed effects on the fishery potential of Lake Victoria. Initially, the introduction provided new opportunities for fishing and contributed to the expansion of the fishery industry. Tilapiines, particularly the Nile tilapia hybrids, are known for their fast growth and high reproductive rates, which made them an attractive target for commercial fishing. The increased availability of Tilapiines led to economic benefits for fishing communities and contributed to local livelihoods [6].

However, the proliferation of Tilapiines has also posed challenges to the fishery. The high reproductive capacity and aggressive behavior of Tilapiines have led to overpopulation and increased competition for resources. This has resulted in slower growth rates and smaller sizes of individual fish, reducing their market value. Moreover, the dominance of Tilapiines in the fishery has resulted in a loss of diversity in catch composition, as other native species are overshadowed and less targeted [16]. This raises concerns about the resilience and long-term sustainability of the fishery, as it becomes more vulnerable to environmental changes and disease outbreaks. The ecological and socioeconomic impacts of introduced Tilapiines highlight the need for careful management and conservation strategies in Lake Victoria [6, 7]. Efforts are being made to balance the conservation of native fish species, the control of invasive Tilapiines, and the sustainable use of the lake's resources. These include implementing fishing regulations, promoting sustainable fishing practices, and conducting research on the impacts of Tilapiine populations [21]. Therefore, the introduction of Tilapiines, particularly the Nile tilapia and its hybrids, to Lake Victoria has had significant impacts on the lake's ecology and fishery potential. The alteration of the trophic structure, changes in nutrient dynamics, and challenges to the fishery industry are among the consequences of this introduction. Balancing the conservation of native species, management of invasive Tilapiines, and sustainable fishing practices are crucial for ensuring the long-term health and productivity of Lake Victoria's ecosystem and the well-being of local communities [10].

3. Introduced aquatic macrophytes species and their impacts on the ecology and fishery potential of Lake Victoria

Macrophytes are aquatic plants that play a significant role in the ecology and fishery potential of Lake Victoria, the largest tropical lake in Africa. These plants, which include both native and invasive species, have diverse impacts on the lake's ecosystem. Native macrophytes in Lake Victoria, such as various species of submerged plants, floating plants, and emergent plants, provide important ecological functions. They serve as habitats and spawning grounds for fish, provide food sources, and contribute to the overall biodiversity of the lake [10]. Submerged plants, for instance, offer shelter for small fish and provide areas for the attachment of algae and other organisms. Floating plants, like water lilies, create sheltered areas for young fish, while emergent plants, such as papyrus, form dense stands along the lake's shoreline, offering nesting sites for birds and other wildlife [22]. However, the presence of invasive macrophytes, notably water hyacinth (*Eichhornia crassipes*), has had significant impacts on the ecology and fishery potential of Lake Victoria. Water hyacinth, originally introduced as an ornamental plant, has rapidly spread across the lake, forming dense mats that cover large areas of the water surface. These mats block sunlight, hampering the growth of submerged plants and leading to reduced oxygen levels in the water. The reduced oxygen levels can cause fish kills and negatively impact other aquatic organisms [23]. Additionally, the mats impede water flow, disrupt navigation, and reduce available habitat for fish and other wildlife, affecting fishery activities. Managing the presence of invasive macrophytes and promoting the growth and conservation of native macrophytes are essential for maintaining the ecological balance and fishery potential of Lake Victoria [24].

3.1 Water hyacinth (*Eichhornia crassipes*)

Water hyacinth (*Eichhornia crassipes*) is an invasive macrophyte species that has become a major ecological and economic concern in Lake Victoria, the largest tropical lake in Africa. Originally introduced as an ornamental plant, water hyacinth has rapidly spread across the lake, forming dense mats that cover large areas of the water surface. Water hyacinth (*Eichhornia crassipes*) is a free-floating macrophyte that established in the lake due to nutrient influxes [16]. Water hyacinth was reportedly introduced to Lake Victoria from the Ugandan sector through the mouth of River Kagera [25]. Water hyacinth's ability to reproduce rapidly and form dense mats has contributed to its status as an invasive species in Lake Victoria. The plant's floating nature allows it to easily spread across the water surface, aided by wind, water currents, and human activities. The absence of natural predators and competitors in the lake has further facilitated its uncontrolled growth. Water hyacinth thrives in eutrophic conditions, taking advantage of high nutrient levels resulting from agricultural runoff and untreated sewage discharge [20]. The proliferation of water hyacinth has had severe ecological consequences in Lake Victoria. The dense mats of water hyacinth block sunlight, reducing photosynthesis and oxygen levels in the water. This inhibits the growth of submerged aquatic plants and disrupts the balance of the lake's ecosystem. The reduced oxygen levels also lead to fish kills and negatively impact other aquatic organisms [10]. Additionally, water hyacinth alters the physical structure of the lake by impeding water flow, hindering navigation, and reducing the available habitat for fish and other wildlife. The mats create stagnant water pockets, which promote the breeding of disease-carrying mosquitoes,

increasing the risk of malaria and other waterborne diseases among the human population living near the lake [22].

Lake Victoria is renowned for its vibrant fisheries, providing a source of livelihood for millions of people. However, water hyacinth has severely impacted the fishery potential of the lake. The dense mats of the plant reduce access to fishing grounds, making it difficult for fishers to cast their nets or use traditional fishing gear [23]. As a result, fish catches have significantly declined, leading to economic losses and food insecurity. The plant's dense growth also alters the food web dynamics in the lake. Water hyacinth outcompetes and displaces native aquatic plants, which serve as important habitats and food sources for fish. The reduction in the availability of suitable spawning grounds and food for young fish hampers their survival and growth [10, 26]. Consequently, fish populations, particularly those that rely on submerged vegetation, have declined. Water hyacinth also reduces fishing pressure in the intensively infested areas by blocking the movement of fishing crafts and deployment of the fishing gear. The weed has contributed to reduced primary productivity of the lake due to shading of phytoplankton by water hyacinth mats. In addition, the water hyacinth mats also restrict wind action on surface waters preventing the exchange of oxygen across the air-water interface [25]. They also deplete dissolved oxygen from the water column through the microbial breakdown of decomposing plant remains [16]. This creates anoxic conditions that cause deleterious effects to aquatic organisms and can lead to massive fish mortalities [17]. In addition, this range falls below the lethal limit of 2 mg l^{-1} that is detrimental to fish survival and can often cause massive fish mortalities [27]. Studies have shown that *Lates niloticus* and *Rastrineobola argentea* mainly occur in the oxygenated open waters because they are sensitive to low DO levels of less than 5 mg l^{-1} [8]. This excludes *L. niloticus* and *R. argentea* from areas covered by water hyacinth mats that have reportedly recorded low DO levels ranging from 1.32 to 3.68 mg l^{-1} [28]. In addition, the proliferation of water hyacinth has led to the recovery of hypoxia tolerant native fish species as catfishes, *haplochromines*, *Protopterus aethiopicus*, and *O. niloticus* that find refugia from predation beneath water hyacinth mats [7, 16]. According to Meerhoff et al. [12, 25], the abundance and diversity of fish species in Lake Victoria were higher in submerged vegetation, followed by water hyacinth and unvegetated littoral sites. The marked differences in fish diversities between open waters and water hyacinth infested areas can be attributed to exclusion of *L. niloticus* which preys upon most native species as well as food, shelter, and refugia provided to the fishes by water hyacinth mats [12]. Several methods (biological, chemical, and mechanical) have been used by the three riparian countries to control the weed with very little success. It has been suggested that reducing nutrient loads through influent rivers can curtail the proliferation of the water hyacinth within the lake [7, 12, 16]. Numerous strategies have been implemented to mitigate the impacts of water hyacinth in Lake Victoria. These include manual and mechanical removal, biological control using weevils (*Neochetina* spp.), and the development of eco-friendly technologies for harvesting and processing the plant. These efforts aim to control the spread of water hyacinth, restore ecological balance, and revive the fishery potential of the lake [12].

3.2 Dense waterweed (*Egeria densa* Planchon)

Like water hyacinth, Dense waterweed, *Egeria densa* is endemic to warm tropical and temperate lakes in South America [18]. The plant belongs to family Hydrocharitaceae of submerged monocotyledonous perennial aquatic plants

(**Figure 1**). Little has been documented about the ecology of these plant in Lake Victoria. Nevertheless, the plant has been observed to grow in the shallow inshore areas of the Kenyan sector, forming dense and thick mats with intertwining stems, and rooted 1–2 m below the water surface [21]. Furthermore, the plant persists as fragments that drift in the water column, which are propagated into thick and extensive mats that cover large and expansive areas of the water column [9, 18, 21]. This helps to absorb nutrients locked in the substrate, making them available to biota. The plant is successfully propagated in a submerged environment due to its physiological adaptations related to its metabolism [29].

These traits enable the plant to photosynthesize under low CO₂ concentration, non-optimal water temperatures, and different nutrient concentrations of water and sediments that affect plant metabolism and ultimately community structure and distribution of the plants [21, 30, 31]. For instance, *Egeria densa*, exhibits the C4 pathway and utilizes bicarbonates HCO₃⁻ in waters with low CO₂ levels, can tolerate high phosphorous levels, but is susceptible to iron deficiency. Despite being able to thrive in turbid environments [10, 30], the plant has been displaced, having low populations in areas covered by dense mats of Water Hyacinth.

Note: The presence of large populations of *E. densa* decreases water turbulence and resuspension of sediments, which increases the amount of light available in the water column. By sequestering nutrients from sediments, *E. densa* reduces phytoplankton biomass and increases zooplankton abundance and distribution by providing refugia against their predation (**Figure 2**). However, in the long-term plants may result in the increase in sediment height [9].

As a dominant species in the nutrient dynamics, *E. densa* frequently influences phytoplankton biomass by shading phytoplankton in the water column, and can provide refugia to zooplankton and fish escaping predation [22, 23, 32, 33]. Given its tendency to acquire nutrients from the water column, *E. densa* can reduce nutrient availability for phytoplankton. The highly invasive nature of *Egeria* results in the weed outcompeting and displacing native underwater vegetation such as floating pondweed and ribbon weed [24, 34, 35].

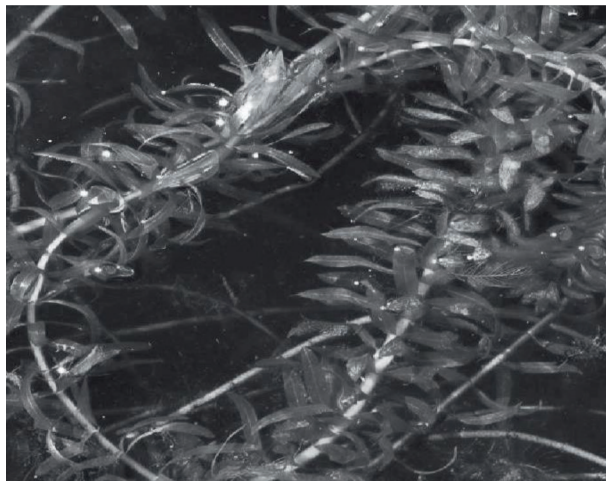


Figure 1.
Photograph of *Egeria densa* (Planchon) [9].

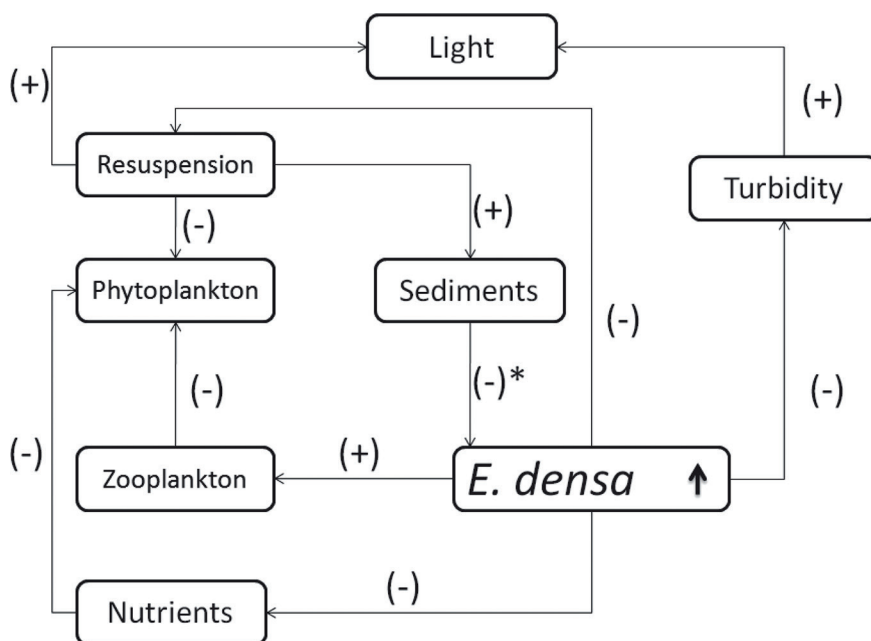


Figure 2.
Egeria densa as an ecosystem engineer.

4. The aftermath of species introductions

The decline and virtual disappearance of native fisheries in Lake Victoria can be attributed to overexploitation, destructive fishing, and introduction of non-native species [26]. The major cyprinids, *Labeobarbus altianialis*, and African carp *Labeo victorianus*, are currently redlisted among the critically endangered species by IUCN [36]. *Labeo victorianus* is a potamodromous fish that migrates from the lake to the major influent streams and tributaries such as Sondu, Kuja, and Mara during the rainy season to spawn in the floodplains [36]. According to Balirwa et al. [7], the contribution of *L. altianialis* to fish landings from Lake Victoria declined from 8173 tons in the 1980s to 152 tons in the late 1990s and early 2000. Before the establishment *L. niloticus* as a top predator, the catfishes *Bagrus docmak*, *Clarias gariepinus*, and *Schilbe intermedius* were the apex predators in the lake [15]. While *B. docmak* disappeared completely, *C. gariepinus* and *S. intermedius* were not greatly affected by this ecological change. Although *S. intermedius* can partly occupy open waters, it has been the main target species of the gill net fishery in the inshore areas, resulting to its decline over the years. On the other hand, the population of *C. gariepinus* is replenished by continuous recruitment of juveniles from major influent rivers. Populations of the African lungfish *Protopterus aethiopicus* in Lake Victoria have also reported a remarkable decline in the past, for instance, from 0.3 to 0.07 tons between 1986 and 1990 [37]. This could be attributed to loss of refugia caused by wetland conversion, and decreased recruitment, due to harvesting of the nest-guarding male lungfish [11]. Other possible reasons for this decline could be predation by the voracious Nile perch, declining food resources and habitat alteration [11, 37].

5. Conclusion and recommendations

In Lake Victoria, introduction of non-native cichlids such as *Lates niloticus*, *Oreochromis niloticus*, *Tilapia zillii*, and *Oreochromis leucostictus* had negative and positive impacts on the fishery potential and the ecology of the lake. These include interspecific competition among the introduced and native Tilapiines, hybridization of native tilapia by *O. niloticus*. The most remarkable change observed in Lake Victoria fisheries is the decline and total disappearance of endemic Tilapiines *Oreochromis esculentus* and *O. variabilis*, some catfishes (*Xenoclarias eupogon*), several species of Haplochromines and the cyprinids *Labeo victorianus* and *Labeobarbus altinialis*. This has significantly reduced the lake biodiversity, and prompted the introduction of non-native species such as *Lates niloticus* and four non-native Tilapiines including *O. niloticus* into the lake. There is a need to assess current fishery management strategies and formulate new ones based on sound scientific research, which can be implemented in order to prevent loss of biodiversity. On the other hand, some introduced species have led to increase in fish landings as well as utilization of unoccupied niches. Successful establishment and infestation of water hyacinth, *Eichhornia crassipes* out-competed Nile cabbage, *Pistia stratiotes* and dense waterweed *Egelia densa* resulting to shading, increased turbidity, and reduced dissolved oxygen levels. This has been a major factor contributing to dwindling trends in *L. niloticus* and *R. argentea* fisheries in the lake. However, proliferation of the macrophyte has recently contributed to re-emergence of some native species such as catfishes, haplochromines, *O. niloticus*, and the African lungfish *P. aethiopicus*. Future introductions should be based on sound scientific research in order to minimize the effects of introduced species on native species in the new ecosystems.

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