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RESEARCH PAPER

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Preliminary floral and faunal species diversity in Maluyo River in Santol, La Union, Philippines

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ABSTRACT

This study conducted a preliminary biodiversity assessment of flora and fauna along the Maluyo River ecosystem, covering upstream, midstream, and downstream sections. Habitat conditions and environmental characteristics were documented to support ecological evaluation. Species were identified through initial field assessments using standardized ecological techniques and taxonomic references. Data were organized and analyzed to determine patterns of species diversity and ecosystem condition. Findings provide baseline information for biodiversity monitoring and contribute to future conservation and management strategies in the river ecosystem. There are 47 diverse floral and vegetation and 16 faunal species observed along the downstream, mid stream and upper stream part of the Maluyo riverbank in Santol La Union, Philippines. The biodiversity of flora and fauna along the Maluyo River plays a significant role in the ecological, economic, and social development of the Municipality of Santol. Ecologically, it supports environmental stability by preventing erosion, improving water quality, maintaining habitat balance, and reducing risks of flooding and land degradation. Economically, river resources provide food, livelihood opportunities, agricultural support, and potential uses for medicinal and useful plants. Socially, biodiversity enhances community well-being, environmental awareness, and opportunities for conservation education and eco-tourism. Overall, conserving the river's biological resources is essential for sustainable development, livelihood security, and long-term ecological resilience in Santol.

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INTRODUCTION

Rivers provide diverse ecosystem services i.e., drinking water, irrigation, ecotourism and recreational activities, and fisheries, and other role of rivers in supporting man activities is invaluable. But, human pressure on rivers (such as channelizing rivers to divert water for human use) and the damming of rivers (for hydroelectric power generation) have already impacted river ecological and morphological integrity (Guzelj, M. et al, 2020) destroying various habitats and reducing aquatic biodiversity. In addition, pollutant inflow from the water-sheds, especially discharges from big cities or agricultural areas, substantially influences the chemical content of water and suspended sediments in given localities (Abdollahi, Z., 2019) ,inevitably affecting some of the river ecosystem services.

More than half of the world's river basins, representing 40% of the world's continental surface and 37% of the world's river length, have experienced deep anthropogenic changes impacting fish biodiversity (Su, G. et al, 2021) For instance, biodiversity supports all types of ecosystem services, as it underpins all ecosystem processes (Mace, G.M et al, 2011; and Lin, Z. et al 2022). Maluyo River, is an example of ecosystem services and stands as one of the most important natural resources in the Municipality of Santol, La Union. For generations, it has quietly supported the lives of local communities, providing water for households, farming, and livelihoods. More than just a body of water, the river has influenced the daily routines, agricultural activities, and cultural traditions of the barangays along its banks. It waters crops, supplies for household needs, offers spaces for recreation and social interaction, and quietly observes the changing history of the town.

Through times of environmental challenge, Maluyo River has remained a key source of support for the people. During dry seasons, its steady flow is essential for maintaining farmlands and daily life, while in the rainy months, its currents remind the community of nature's power and fragility. The story of Maluyo River is therefore not only about water, it is a story of resilience, unity, and the enduring bond between people and their environment. The name Maluyo, therefore, is not merely a label but an identity born from observation, experience, and respect for nature. It reflects how closely people have long lived in harmony with their surroundings (https://launion.gov.ph/municipality-of-santol).

Maluyo River traverses both upland and lowland areas of the Municipality of Santol. Flowing through agricultural fields and residential zones, the river creates a natural network connecting people, land, and livelihoods. Its banks are composed of a combination of fertile soil, sand deposits, and scattered stones shaped through time by continuous water movement.. The river varies in width and depth depending on seasonal rainfall. During rainy seasons, the river expands and strengthens, while in dry seasons it becomes narrower and gentler, revealing stones and sandbars. Despite these seasonal fluctuations, it continues to provide sufficient water throughout most of the year. Residents, however, have long adapted to these seasonal changes, making adjustments in farming schedules, crop planning, and daily routines. During the dry season, the river transforms into a calmer, slower-moving stream.

Although water levels drop, the flow generally remains reliable enough to support irrigation and daily domestic use.

Thus, knowledge of the floral and faunal diversity of river ecosystems is essential for assessing ecological health, understanding ecosystem functions, and promoting sustainable resource management. Diverse plant and animal communities serve as biological indicators that reflect environmental conditions and habitat quality within river systems. The presence, abundance, and distribution of species provide valuable information on ecological stability, nutrient cycling, and food web dynamics.

Moreover, documenting biodiversity establishes baseline data necessary for monitoring environmental changes, identifying threats, and developing conservation and restoration strategies. Therefore, evaluating river biodiversity is crucial not only for scientific understanding but also for ensuring the protection of ecological services that support local communities and long-term environmental sustainability. Thus, this preliminary exploratory faunal and floral diversity in the Maluyo river in Santol La Union was conducted.

MATERIALS AND METHODS

Data gathering for flora and fauna biodiversity in Maluyo riverbanks and river ecosystems began with defining clear study objectives, such as assessing species diversity, abundance, habitat condition, and ecological health. Once objectives were established, appropriate study sites were selected and delineated to represent different sections of the river, such as upstream, midstream, and downstream areas, including both the river channel and the riparian or riverbank zones (Fig. 1).

Fig. 1. Maluyo River during the rainy season showing higher water levels

A preliminary habitat assessment was then conducted to document physical and environmental characteristics, including flow type, river width and depth, substrate composition, vegetation cover, signs of erosion, and human disturbances. After the initial assessment, a sampling design was developed using standardized ecological methods to ensure consistency and comparability of data.

For flora, data collection commonly involved quadrat and transect sampling methods to record plant species composition, abundance, and percent cover along the riverbanks and aquatic zones, but in this study preliminary assessment of available species was conducted.

For fauna, although multiple techniques were applied depending on the target organisms, such as nets or kick sampling for aquatic organisms, visual encounter surveys, bird counts, camera traps, or pitfall traps for terrestrial and semi-aquatic species with available protocol, in the same manner only initial assessmenet of available organisms was conducted and identified. Collected specimens and observations were then identified using field guides, taxonomic keys, or expert validation, with photographic documentation or specimen preservation when necessary. The gathered data were organized and encoded into structured datasets to facilitate analysis and long-term monitoring. Quality control procedures were conducted to check for errors, duplication, and inconsistencies in records.

Biodiversity analysis followed, typically involving calculations of species richness, abundance, diversity indices, and comparative analysis among sites or seasons. Finally, results were interpreted in relation to habitat condition, environmental quality, and anthropogenic influences to evaluate ecosystem health.

The process concluded with the preparation of a comprehensive report that included species inventories, habitat descriptions, data analyses, and recommendations for conservation or management, ensuring that the study could be replicated and used as a basis for future biodiversity monitoring efforts.

RESULTS AND DISCUSSION

Table 1 and Fig. 1 present the diverse vegetation observed along the downstream riverbank of the Maluyo River in Barangay Corro-oy, Santol, La Union, showing a mixture of food crops, ornamental plants, grasses, vines, and naturally occurring species that collectively reflect a highly dynamic riparian ecosystem. The recorded plants include edible and economically valuable species such as bitter gourd, cowpea, kangkong, sweet potato, taro, sponge gourd, and coconut, which indicate that the riverbank supports both natural vegetation and human-influenced agricultural or backyard cultivation (https://powo.science.kew.org/taxon/2934131).

The presence of semi-aquatic species like kangkong suggests adequate moisture and periodic flooding, conditions common in riverine environments. Several climbing and creeping plants, including bitter vine and ivy-leaved morning-glory, demonstrate the adaptability of vegetation to riverbank soils where competition for sunlight and support structures is high.

Fig. 1. Diverse vegetation observed along the downstream riverbank of Maluyo River, located in Barangay Corro-oy, Santol, La Union, Philippines

Table 1. Diverse vegetation observed along the downstream riverbank of Maluyo River, located in Barangay Corro-oy, Santol, La Union

Common name	Local name (Tagalog)	Ilocano name	Scientific name	Place of Origin	Description
Bitter gourd	Ampalaya	Paria	*Momordica charantia*	India/Tropical Asia	A tropical vine with warty, bitter-tasting fruits; used for cooking and medicinal purposes.
Cowpea	Baguio/ Patani	Dadag	*Vigna unguiculata*	Africa/Asia	A leguminous plant producing edible pods and seeds; nitrogen-fixing and drought-tolerant.
Kangkong	Kangkong	Kangkong	*Ipomoea aquatica*	Southeast Asia	A semi-aquatic leafy vegetable with hollow stems; commonly eaten as salad or in soups.
Zinia	Rosas de papel	Zinia	*Zinnia elegans*	Mexico	An ornamental flowering plant with bright, daisy-like flowers; attracts pollinators.
Crowfoot grass	Ulan-Ulan	Paragis	*Dactyloctenium aegyptium*	Africa	A fast-growing grass species; commonly found in pastures and disturbed soils.
Sweet potato	Kamote	Kamote	*Ipomoea batatas*	Central & South America	A trailing vine producing edible, starchy tubers; rich in vitamins.
Bamboo	Kawayan	Kawayan	*Bambusa* spp.	Asia	Woody grass species with hollow stems; used for construction, crafts, and food shoots.
Taro plant	Gabi	Aba	*Colocasia esculenta*	Southeast Asia	A perennial plant with edible corms and leaves; staple in many tropical regions.
Cyanotis cristata	Anonang damo	Anonang damo	*Cyanotis cristata*	Asia	A small perennial herb with hairy stems; used for ornamental and medicinal purposes.
Bitter vine	Alibangbang	Alibangbang	*Paederia foetida*	Asia	A climbing vine with pungent leaves; used in traditional medicine.
Sponge gourd	Patola	Kabatite	*Luffa cylindrica*	Asia	A climbing vine producing fibrous fruits used as natural sponges when mature.
Sensitive plant	Makahiya	Bain-Bain	*Mimosa pudica*	South America	A creeping herb whose leaves fold inward when touched; medicinal and ornamental.
Ivy-leaved morning glory	Kampanilya	Kampanilya	*Ipomoea hederacea*	Central America	A climbing vine with heart-shaped leaves and purple flowers; ornamental plant.
Coconut	Niyog	Niyog	*Cocos nucifera*	Southeast Asia/Pacific Islands	A tall palm producing coconuts; used for food, oil, and fiber.
Lantana	Kantutay	Bangbangsit	*Lantana camara*	Central & South America	A flowering shrub with multicolored clusters; attracts pollinators and used ornamentally.

Ornamental species such as common zinnia and lantana imply human settlement influence and contribute to pollinator attraction, enhancing local biodiversity. Grasses and herbaceous plants like crowfoot grass, cyanotis cristata, and sensitive plant indicate disturbed or open soil areas and play an important role in ground cover, erosion control, and habitat provision for small organisms. The inclusion of bamboo further highlights ecological and socioeconomic significance, as it stabilizes riverbanks while serving as a material resource for local communities.

Overall, the vegetation profile reflects a combination of native and introduced species from various regions of origin, illustrating ecological diversity, human utilization, and the adaptive nature of plants thriving in downstream riverbank environments.

The plant species documented along the downstream section of the Maluyo River play significant ecological, economic, and environmental roles that help maintain the health and stability of the river ecosystem. Many of the recorded species, such as kangkong, taro, bamboo, and grasses, contribute to riverbank stabilization by binding soil with their root systems, thereby reducing erosion and sediment runoff during heavy rains or flooding events.

Food and livelihood plants like bitter gourd, cowpea, sweet potato, sponge gourd, and coconut provide direct benefits to nearby communities by supporting household nutrition, small-scale farming, and local income opportunities.

Fig. 2. Diverse vegetation observed along the midstream riverbank of Maluyo River, located in Barangay Lettac Norte, Santol, La Union

The presence of flowering plants such as common zinnia and lantana enhances ecological balance by attracting pollinators like insects and butterflies, which are essential for maintaining plant reproduction and biodiversity in the area. Meanwhile, creeping herbs and ground-cover species, including sensitive plant and crowfoot grass, help protect exposed soil, retain moisture, and create microhabitats for small organisms, contributing to overall ecological resilience. Some species also possess medicinal and cultural value, reflecting the connection between local residents and natural resources along the riverbank.

Collectively, these plants serve as indicators of environmental conditions and demonstrate how natural vegetation and human-utilized species coexist, supporting biodiversity conservation, riverbank protection, and sustainable community use within the Maluyo River ecosystem.

Table 2. Diverse vegetation observed along the midstream riverbank of Maluyo River, located in Barangay Lettac Norte, Santol, La Union

Common name	Local name (Tagalog)	Ilocano name	Scientific name	Place of origin	Description
Chinese silver grass	Talahib	Talahib	*Miscanthus sinensis*	China	An ornamental tall grass with silvery plumes; used for landscaping and erosion control.
Carpet weed/ Calico plant	Papait	Papait	*Mollugo verticillata*	North America	A low-growing groundcover with small green leaves and tiny white flowers; often found in gardens and lawns.
Sensitive plant	Makahiya	Bain-Bain	*Mimosa pudica*	South America	A creeping herb whose leaves fold inward when touched; medicinal and ornamental.
Creeping oxeye	Singapore daisy	Singapore daisy	*Wedelia trilobata*	Central America	A trailing flowering plant with yellow daisy-like flowers; used for groundcover.
Little bell (Three lobed morning glory)	Kampanilya	Kampanilya	*Ipomoea triloba*	Central America	A fast-growing climbing vine with small trumpet-shaped flowers; ornamental.
Little ironweed /False daisy	Tinta - tintahan	Tinta - tintahan	*Eclipta prostrata*	Southeast Asia	An herbaceous plant with small purple flowers; used medicinally for liver and skin ailments.
String bean	Sitaw	Utong	*Vigna unguiculata* subsp. *sesquipedalis*	Southeast Asia	A climbing legume producing long pods; rich in protein.
Manila leea	Bago-Bago	Bago-Bago	*Leea indica*	Southeast Asia	A shrub or small tree with compound leaves and small greenish flowers; used medicinally.
Siam weed	Hagonoy	Hagonoy	*Chromolaena odorata*	Central/South America	A fast-growing invasive shrub; used traditionally for wound healing.
Plumed cockscomb	Palong manok	Palong manok	*Celosia argentea*	Africa/Asia	An ornamental plant with bright, feathery flower spikes; popular in gardens.
Thumbai/Wild ocimum	Balanio/ Tulsi	Balanio	*Ocimum tenuiflorum*	India	A perennial aromatic herb with medicinal and religious uses; also known as holy basil.
Guadeloupe cucumber	Pipinong ligaw	Pipino nga atap	*Cucumis anguria*	Caribbean	A vine producing small, spiny cucumbers; edible and used in pickles.
Taro plant	Gabi	Aba	*Colocasia esculenta*	Southeast Asia	A perennial plant with edible corms and leaves; staple in many tropical regions.
False nettle	Ramie	Lipang aso	*Boehmeria nivea*	Asia	A herbaceous plant resembling stinging nettle; used for fiber and medicinal purposes.
Cassava	Kamoteng kahoy	Kamoteng kahoy	*Manihot esculenta*	South America	A shrub producing starchy tuberous roots; widely cultivated for food and flour.

Table 2 and Fig. 2 highlight the diverse vegetation recorded along the midstream riverbank of the Maluyo River in Barangay Lettac Norte, demonstrating a complex mixture of wild, ornamental, medicinal, and food-producing plant species that collectively support ecological stability and community livelihoods. Compared with downstream areas, the midstream section often experiences moderate water flow, periodic disturbance, and varying soil moisture, creating suitable conditions for both grasses and creeping groundcovers.

Dominant species such as Chinese silver grass, carpet weed, and creeping oxeye play a critical role in soil stabilization and erosion control by forming dense vegetative cover that reduces surface runoff and protects the riverbank from degradation. The presence of climbing vines like little bell (morning glory), string bean, and Guadeloupe cucumber reflects the adaptive nature of riparian vegetation, where plants maximize available space and sunlight by using nearby shrubs and structures as support.

Medicinal and culturally significant species, including little ironweed, holy basil, Manila leea, and false nettle, indicate the ecological value of the area as a reservoir of ethnobotanical resources that may support traditional healthcare practices among local communities. Food crops such as cassava, taro, and string bean suggest that portions of the midstream riverbank are influenced by human cultivation or semi-managed agroecosystems, demonstrating the interaction between natural vegetation and local subsistence farming. While these productive species provide nutritional and economic benefits, the occurrence of fast-growing plants like Siam weed also signals ecological challenges, as invasive shrubs can compete with native flora and alter habitat structure if not properly managed. Overall, the vegetation diversity in the midstream section illustrates a balanced but dynamic ecosystem where natural ecological processes and human activities coexist. Groundcovers, shrubs, vines, and herbaceous plants together contribute to biodiversity conservation, microhabitat formation, and riverbank protection. This plant assemblage also serves as an indicator of environmental conditions, showing that the midstream zone functions as an important transition area that supports both ecological resilience and local resource use within the broader Maluyo River system.

The vegetation observed along the midstream riverbank of the Maluyo River holds significant importance for both the surrounding community and the natural environment, as it provides ecological protection, livelihood support, and ecological balance within the river system.

From an environmental perspective, many of the species function as natural stabilizers of the riverbank. Grasses, groundcovers, and creeping plants such as Chinese silver grass, creeping oxeye, and carpet weed help reduce soil erosion by holding the soil together through their extensive root systems, thereby minimizing sedimentation and maintaining water quality.

Dense vegetation also serves as a natural buffer that filters pollutants, slows surface runoff during heavy rainfall, and reduces the impact of flooding, which is particularly important in midstream zones where water flow is moderate but dynamic. In addition, the variety of plant forms—grasses, vines, shrubs, and herbs—creates habitats and food sources for insects, birds, and other small organisms, contributing to biodiversity conservation and ecological stability.

For the local community, these vegetation species provide direct and indirect benefits that support daily living and traditional practices. Edible plants such as string beans, cassava, taro, and wild cucumber contribute to household food security and can supplement income through small-scale cultivation or harvest. Medicinal plants like holy basil, little ironweed, and Manila leea hold cultural and health value, as they are often used in traditional remedies for common ailments. Some species, such as false nettle, also offer economic potential through fiber production and other practical uses. Furthermore, ornamental plants contribute aesthetic value and may support pollinators, which are essential for crop productivity in nearby farms and gardens.

Overall, the vegetation in the midstream riverbank serves as a vital link between the environment and human communities. Ecologically, it sustains river health, protects land resources, and supports biodiversity; socially and economically, it provides food, medicine, raw materials, and ecosystem services that enhance community resilience. Preserving and managing these plant species responsibly is therefore essential not only for maintaining environmental integrity but also for sustaining the livelihoods and well-being of people who depend on the Maluyo River ecosystem.

Fig. 2. Diverse vegetation observed along the upstream riverbank of Maluyo River, located in Barangay Mangaan Santol, La Union

Table 3. Diverse vegetation observed along the upstream riverbank of Maluyo River, located in Barangay Mangaan Santol, La Union

Common name	Local name (Tagalog)	Ilocano name	Scientific Name	Place of Origin	Description
Taro plant	Gabi	Aba	*Colocasia sculenta*	Southeast Asia	A perennial plant with edible corms and leaves; staple in many tropical regions.
Billygoat weed	Bulak manok	Bulak manok	*Ageratum conyzoides*	Central/ South America	A fast-growing herb with small white or purple flowers; often considered a weed.
Barnyard grass	Palay- daga	Arusip	*Echinochloa crus-galli*	Asia	A common grass found in rice fields and wetlands; used for forage in some regions.
Willow-leaved water croton	Tubli	Dumanay	*Croton lobatus*	Asia	A semi-aquatic plant with willow-like leaves; grows in wetlands and along streams.
Snakeweed	Tsaang asul	Kandi kandilaan	*Stachytarpheta jamaicensis*	Central/ South America	A low-growing shrub with purple flowers; often used ornamentally and for erosion control.
Purple willow	Purple willow	Lilang	*Salix purpurea*	Europe/ Asia	A willow species with slender purple branches; used in landscaping and basketry.
Sweet potato	Kamote	Kamote	*Ipomoea batatas*	Central & South America	A trailing vine producing edible, starchy tubers; rich in vitamins.
Downy maiden fern	Pako	Pako	*Thelypteris dentata*	Asia/ Pacific	A fern with feathery, soft fronds; commonly found in shaded, moist areas.
Spiny amaranth/ Pigweed	Kulitis	Kalunay	*Amaranthus spinosus*	Tropical America	A fast-growing herbaceous plant with spiny stems; edible leaves in some regions.
Cowpea	Patani	Dadag	*Vigna unguiculata*	Africa/ Asia	A leguminous plant producing edible pods and seeds; nitrogen-fixing and drought-tolerant.
Pinwheel flower	Rosal	Rosal	*Tabernaemontana divaricata*	India/ Southeast Asia	A small shrub with fragrant, pinwheel-shaped flowers; ornamental.
Chia sage	Chia	Chia	*Salvia hispanica*	Central/ South America	An herbaceous plant producing edible seeds rich in omega-3; used in food and drinks.
Indian goose grass	Paragis	Paragis	*Eleusine indica*	India/ Asia	A fast-growing grass common in fields and disturbed soils; used for forage.

Table 3 shows that the upstream section of the Maluyo River in Barangay Mangaan supports a diverse assemblage of vegetation that reflects the ecological conditions typical of upper river environments-cooler water, higher soil moisture, frequent shade, and less intensive human disturbance compared to downstream areas. The presence of moisture-loving plants such as taro, downy maiden fern, willow-leaved water croton, and barnyard grass suggests that this portion of the river provides semi-wetland conditions where water availability remains relatively high throughout the year. These species are well adapted to saturated soils and play an important ecological role in stabilizing streambanks, slowing runoff, and reducing soil erosion, which helps protect the river's water quality as it flows toward midstream and downstream zones. The upstream vegetation also reveals a mixture of naturally occurring species and plants influenced by nearby human activity. Crops such as sweet potato, cowpea, and chia indicate small-scale cultivation or incidental spread from agricultural areas, showing how local communities interact with the river landscape for subsistence and food production. At the same time, fast-growing herbs and grasses such as billygoat weed, Indian goose grass, and spiny amaranth demonstrate the ability of pioneer species to colonize disturbed areas, fill open spaces, and prevent bare soil exposure. While some of these are often classified as weeds, their presence contributes to ecological succession by preparing the soil for other plant species and supporting insect populations that form part of the local food web. Shrubs and ornamental plants, including snakeweed and pinwheel flower, add structural diversity to the vegetation, creating microhabitats for insects, birds, and small fauna. Species like purple willow further enhance ecological stability by reinforcing riverbanks through deep root systems that reduce erosion during heavy rainfall and seasonal flow increases. The combination of herbs, grasses, vines, ferns, and shrubs illustrates a layered vegetation structure, which is ecologically important because it promotes biodiversity, regulates microclimate conditions, and improves nutrient cycling within the ecosystem.

Fig. 4. Fauna species observed along Maluyo River from upstream to downstream

Overall, the presence of these plants in the upstream section highlights the role of this area as an ecological foundation of the river system. Upstream vegetation acts as a natural protective zone that maintains water quality, supports wildlife habitats, and moderates sediment transport before water flows into lower sections of the river. The mixture of edible, medicinal, ornamental, and wild species also reflects the balance between natural ecological processes and human reliance on riverbank resources. Protecting this diverse plant community is therefore essential not only for maintaining the ecological integrity of the upstream environment but also for sustaining the overall health and functionality of the entire Maluyo River ecosystem.

The fauna observed along the Maluyo River from upstream to downstream reflects a biologically active river ecosystem where terrestrial, aquatic, and semi-aquatic organisms interact to maintain ecological balance and support local livelihoods. The presence of decomposers such as millipedes is ecologically significant because these organisms break down decaying organic matter and recycle nutrients into the soil, helping sustain riparian vegetation growth. Likewise, invertebrates such as earwigs, caterpillars, grasshoppers, wolf spiders, dragonflies, and damselflies form an important part of the riverbank food web.

Table 4. Fauna species observed along Maluyo River from upstream to downstream

Common name	Local name (Tagalog)	Ilocano name	Scientific name	Place of Origin/ Habitat	Description
Millipede	Alupihan	Alupihang	*Diplopoda* spp.	Worldwide/soil and leaf litter	Segmented arthropods with two pairs of legs per segment; decomposers feeding on decaying organic matter.
Carabao	Kalabaw	Nuang	*Bubalus bubalis*	Philippines/ Southeast Asia	Domesticated water buffalo; used for plowing, transport, and milk production.
Snakehead	Snake head	Dalag	*Channa striata*	Southeast Asia / freshwater rivers	A predatory freshwater fish; important for aquaculture and local cuisine.
Freshwater snail	Freshwater Snail	Suso	*Pomacea canaliculata/ Bellamya* spp.	Freshwater ponds, rivers	Aquatic gastropods; feed on plants and algae; some are invasive species.
Dragonfly	Tutubi	Tuwato	*Odonata* spp.	Freshwater habitats/ wetlands	Flying insects; predators of mosquitoes and other small insects; indicators of healthy water.
Wolf spider	Gagamba	Lawa-Lawa	*Lycosidae* spp.	Grasslands/ forests	Ground-dwelling spiders; hunt prey actively instead of using webs.
Damselfly	Tutubi	Tuwato	*Zygoptera* spp.	Freshwater habitats	Slender flying insects, similar to dragonflies; predators of smaller insects.
Freshwater shrimp	Hipon	Udang	*Macrobrachium* spp.	Rivers/ freshwater bodies	Small crustaceans; important in aquaculture and as food.
Crab	Alimango	Kappi	*Scylla* spp.	Coastal/ freshwater	Crustaceans with a hard exoskeleton; edible and economically important.
Golden apple snail	Kuhol	Bisukol	*Pomacea canaliculata*	Southeast Asia/ rice fields	Invasive freshwater snail; feeds on aquatic plants; agricultural pest.
Cow	Baka	Baka	*Bos taurus*	Domesticated worldwide	Domesticated mammal; source of milk, meat, and labor.
Caterpillar	Uod	Samsamrid	*Lepidoptera larvae*	Worldwide	Larval stage of butterflies and moths; feed on leaves; important in ecology and food webs.
Earwig	Sipit-sipit	Sipit-sipit	*Dermaptera* spp.	Worldwide	Small insects with pincers at the rear; feed on plants and small insects.
Gourami	Lapu-lapu tubig-tabang	Gurgurami	*Osphronemus* spp./ *Trichopodus* spp.	Southeast Asia/ freshwater	Popular aquarium and food fish; adaptable to freshwater ponds.
Grasshopper	Gamu-gamu	Dudon	*Caelifera* spp.	Worldwide/ grasslands	Herbivorous insects; important in ecosystems and as agricultural pests.
Catfish	Hito	Paltat	*Siluriformes* spp.	Freshwater rivers/ ponds	Bottom-dwelling fish; commonly farmed and consumed.

Herbivorous insects feed on vegetation, while predatory species like dragonflies, damselflies, and wolf spiders help regulate insect populations, including mosquitoes and crop pests, making them valuable indicators of ecological health and natural biological control within the river environment.

Aquatic organisms recorded in the river, including snakehead, catfish, gourami, freshwater shrimp, freshwater snails, crabs, and golden apple snails, highlight the productivity of the freshwater ecosystem. Fish species such as snakehead and catfish occupy higher trophic levels as predators or bottom feeders, helping maintain population balance among smaller organisms and contributing to nutrient cycling in the water. Freshwater shrimp and crabs act as scavengers, cleaning organic debris and supporting water quality, while snails play dual ecological roles as algae grazers and nutrient recyclers. However, the presence of species like the golden apple snail also suggests potential ecological and agricultural challenges because some invasive aquatic species may compete with native organisms and damage crops or aquatic vegetation if their populations increase unchecked.

The observation of large domesticated animals such as carabao and cattle along the river indicates the strong interaction between the community and the river ecosystem. These animals rely on river water and surrounding vegetation for drinking and grazing, while also reflecting the agricultural character of the area. At the same time, their presence emphasizes the need for proper riverbank management, since uncontrolled grazing or trampling can contribute to erosion and habitat disturbance.

Overall, the diversity of fauna recorded along the Maluyo River demonstrates a functioning ecosystem where decomposers, herbivores, predators, aquatic species, and domesticated animals coexist and contribute to ecological processes (Table 4, Fig. 4). These organisms collectively support nutrient recycling, pest control, biodiversity maintenance, food production, and livelihood activities for local communities. The presence of such varied fauna from upstream to downstream also suggests that the river serves as a continuous ecological corridor, linking habitats and sustaining biological interactions that are essential for long-term environmental stability and sustainable resource use.

CONCLUSION

The preliminary assessment of the Maluyo River ecosystem revealed a diverse assemblage of floral and faunal species distributed across upstream, midstream, and downstream sections. This diversity reflects a biologically active and functionally integrated river system where natural ecological processes and human activities coexist. The presence of various plant communities, including food crops, medicinal species, grasses, and riparian vegetation, highlights the ecological adaptability and productivity of the riverbanks.

Faunal diversity, ranging from aquatic organisms to terrestrial and semi-aquatic species, further indicates a stable ecosystem capable of supporting multiple trophic levels and ecological interactions. These organisms contribute significantly to nutrient cycling, pest regulation, habitat maintenance, and overall ecosystem balance.

Moreover, the study confirms that the Maluyo River plays a critical role in sustaining environmental stability, supporting local livelihoods, and enhancing community well-being. The river's biodiversity underpins essential ecosystem services such as erosion control, water quality maintenance, food provision, and ecological resilience.

Overall, the findings establish an important baseline for future biodiversity monitoring and emphasize the ecological, economic, and social significance of the Maluyo River ecosystem in Santol, La Union.

RECOMMENDATIONS

To ensure the sustainable management and conservation of the Maluyo River ecosystem, the following measures are recommended:

1. Implement regular biodiversity monitoring programs
   Continuous assessment of flora and fauna should be conducted to track changes in species composition, detect environmental degradation, and support data-driven decision-making.
2. Strengthen riverbank conservation and rehabilitation efforts Reforestation and planting of native riparian vegetation should be encouraged to reduce erosion, improve habitat quality, and enhance ecological stability.
3. Control invasive and potentially harmful species
   Monitoring and management strategies should be developed to regulate invasive plants and animals, such as the golden apple snail and aggressive weeds, to prevent ecological imbalance.
4. Promote sustainable agricultural and land-use practices
   Communities along the river should be guided to adopt environmentally friendly farming methods that minimize pollution, soil erosion, and habitat disturbance.
5. Enhance community awareness and participation
   Environmental education programs should be implemented to increase awareness of biodiversity conservation and encourage local stewardship of river resources.
6. Regulate grazing and human activities along riverbanks
   Proper management of livestock and human activities is necessary to prevent excessive trampling, vegetation loss, and habitat degradation.
7. Develop eco-tourism and conservation-based livelihood programs Sustainable eco-tourism initiatives can be explored to provide alternative income sources while promoting biodiversity conservation and environmental appreciation.
8. Support policy development and local government initiatives

Local authorities should integrate biodiversity conservation into development planning and enforce regulations that protect river ecosystems.

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