Biodiversity in the Atewa Range Forest Reserve, Ghana

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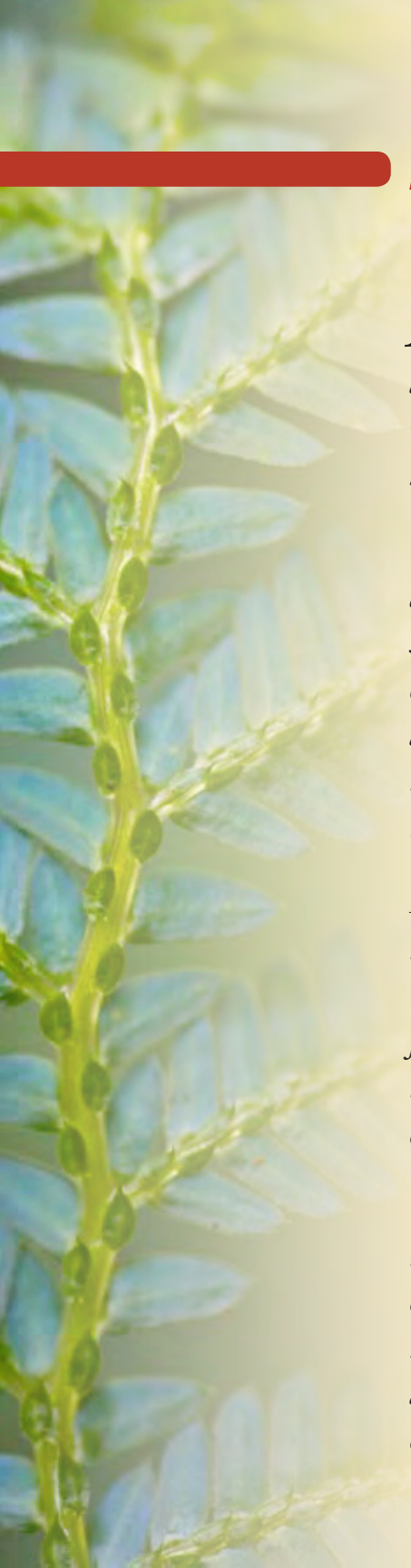

Atewa Range Forest Reserve

The Crown Jewel of Ghana's Biodiversity

Atewa forest is unique. It has excellent biological resources as well as rich bauxite deposits. It has distinctive upland forest vegetation which unfortunately is under threat by illegal logging, hunting and farming activities.

The major threat today, however, is the exploitation of bauxite deposits – a potentially valuable resource to a nation intent upon self-reliance. The benefits to the economy from a successful bauxite operation – in foreign exchange earnings, easing of unemployment, and stimulation of local industry – would indeed be great, but the environmental hazards associated with the exploitation and refining of the bauxite may be incalculable.

In the exploitation of the bauxite, it may be necessary to clear-fell the area, and remove all the topsoil and overburden covering the bauxite. There is therefore the danger that the unique upland forest may be destroyed or at least drastically reduced. At the same time a considerable number of rare species may be threatened or endangered.

The current worldwide interest in pharmaceutical properties of tropical species makes the conservation of the unique biodiversity of the area particularly pertinent. The scientific and educational interest of the upland forests is considerable; the flora is very rich and contains a number of very rare species; the forests are more-or-less undisturbed natural vegetation (rare in West Africa),

and the wide variety of habitats (permanent streams, swamps, closed forest, and natural clearings) support a rich fauna. The topographic variability and the diversity of plants and animals provide considerable potential for tourism, especially as the Atewa Range is the nearest rain forest to Accra. The bauxite deposits will eventually be exhausted, but the forest is a renewable resource which, if protected now, will be appreciated centuries hence long after all the bauxite has gone.

It is my contention that the apparent conflict of interests is not irreconcilable and that, with careful planning and by working together, we can all play a part in developing alternative income activities for the Atewa region and thus achieve long-term conservation of the spectacular biodiversity of the Atewa forest.

Okyeame Ampadu-Agyei
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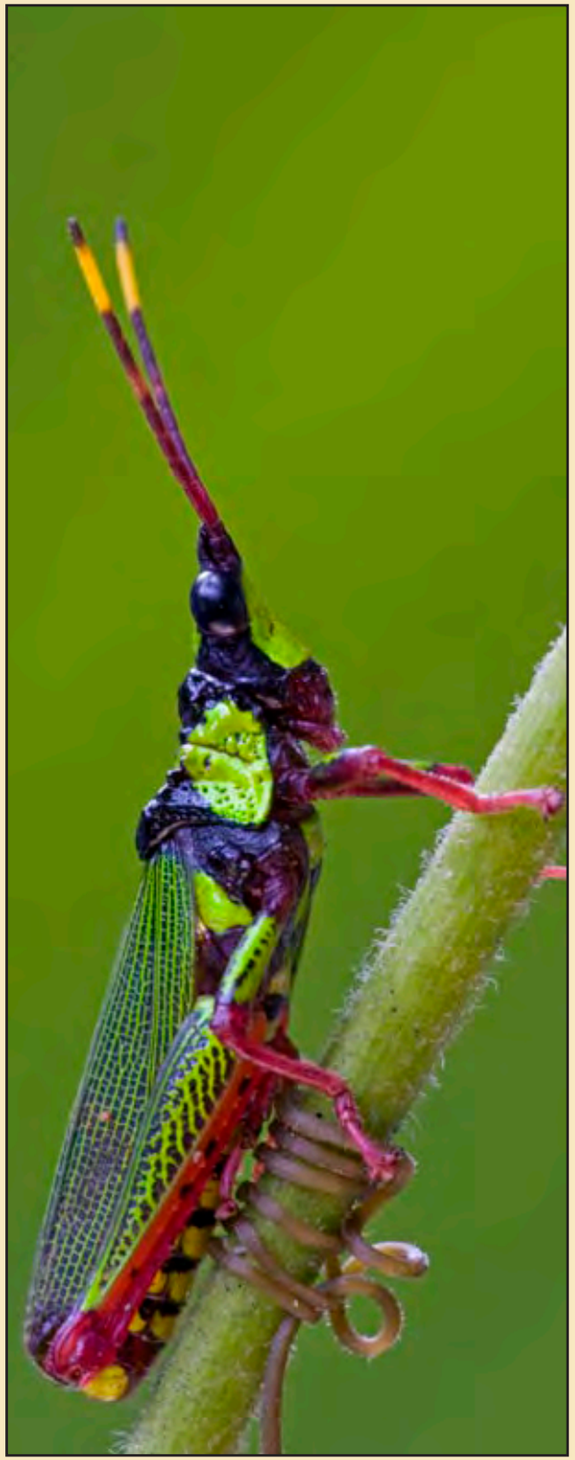


What is biodiversity?

Biodiversity is the variety of plants, animals, and other organisms, the habitats in which they are found, and the ways that these living things interact with each other and with the environment.

The place where a species lives is known as its habitat. A habitat is a home that supplies all that an animal, plant, or other organism needs to survive: air, light, water, food, shelter and space. Plants and animals with their habitats make up an **ecosystem**. Ecosystems contain living things, such as other animals and plants, as well as non-living things such as soil, air, and water. Ecosystems can have variable sizes. For example, a pond is a small ecosystem while a forest is a large ecosystem. All of the earth's ecosystems are part of our planet's biodiversity.

Scientists estimate that there are between 30 and 100 million species of plants, animals and microorganisms (tiny bacteria and other animals) on the planet, yet only about 1.5 million have been described.

* words in **bold** are defined in the glossary on page 28.

Biodiversity and history of the Atewa Range Forest Reserve

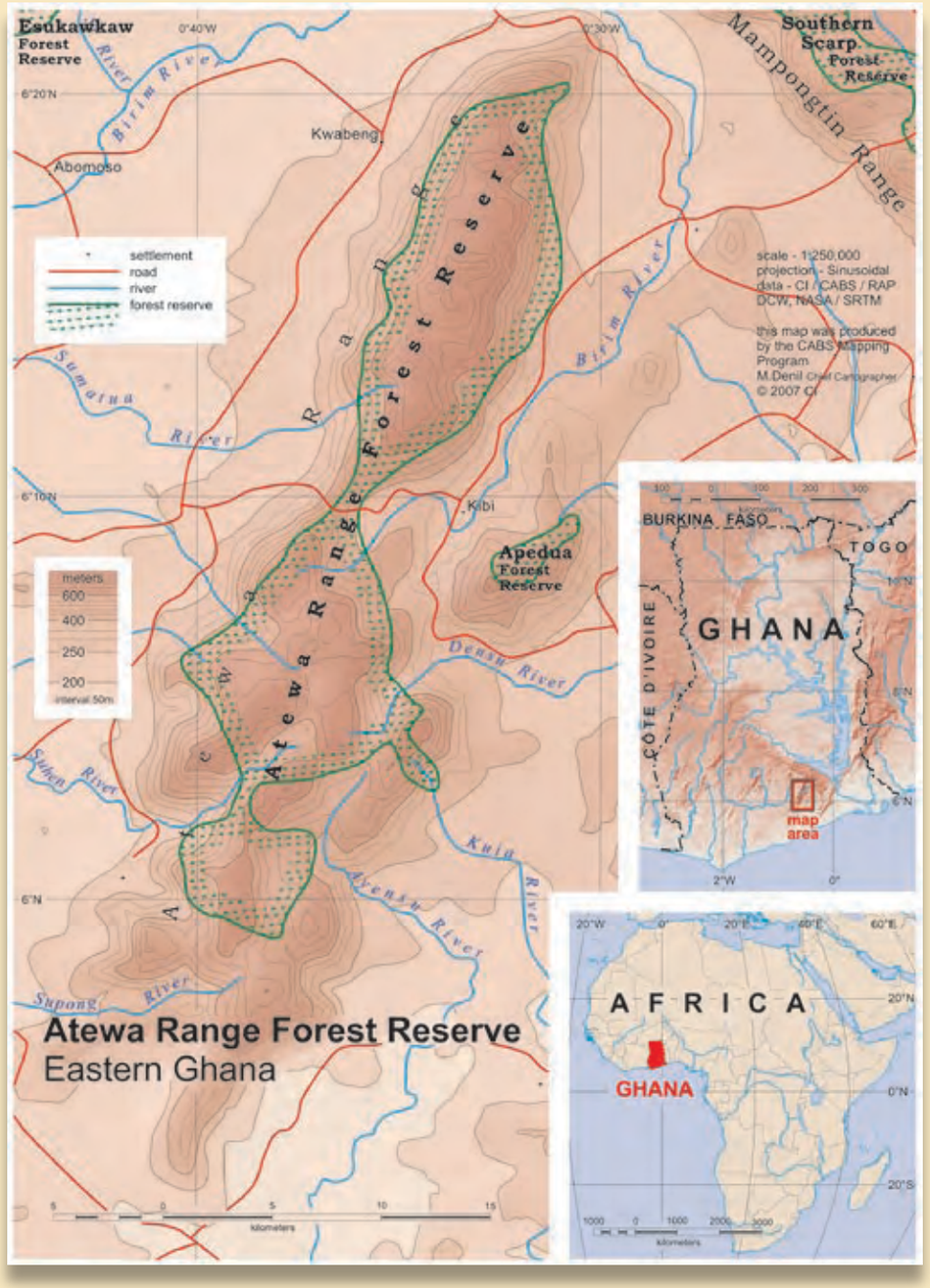
Across West Africa, natural forests have been reduced and fragmented to less than 30% of their original area. The forest patches that remain continue to be degraded or completely lost at an alarming rate. Due to the high number of species found in these forests (biodiversity), high number of species found nowhere else on earth (**endemic species**), and high rate of loss, West African forests have been designated as one of 34 Global Biodiversity **Hotspots**. West African montane (mountain) forests are especially rare and important to protect because they contain unique ecosystems with exceptional species richness and high levels of endemism.

In Ghana, one of the most important and largest forests is the Atewa Range Forest Reserve (23,663 ha). Atewa is unique because it contains Upland Evergreen forest. The only other place in Ghana with this type of forest is the Tano Ofin Forest Reserve, which is much smaller and significantly more disturbed. Over the last 90 years, Atewa has been recognized as an important reservoir of biodiversity and has been officially classified in various ways: as a national forest reserve in 1926, a Special Biological Protection Area in 1994, a Hill Sanctuary in 1995 and as one of Ghana's 30 Globally Significant Biodiversity Areas (GSBAs) in 1999. In 2001, Atewa was listed as an Important Bird Area (IBA) by BirdLife International.

Atewa has also been recognized as a nationally important reserve because the Atewa Range provides the headwaters of three river systems, the Ayensu River, the Densu River and the Birim River. These three rivers are the most important source of domestic and industrial water for local communities as well as for many of Ghana's major population centers, including Accra. Thus, the Atewa forests protect and provide a clean water source for much of Ghana's human population and for key elements of the country's biodiversity.

The results of Rapid Assessment surveys conducted by Conservation International presented in this booklet confirm that the Atewa Range Forest Reserve is an extremely important site for global biodiversity conservation which should be protected to the fullest extent possible. At the same time, the livelihood of the communities around Atewa must be considered in order to ensure long-term protection of the forest.

Map of the Atewa Range Forest Reserve



Why is Biodiversity Important to You?

The biodiversity — animals, plants, forests, streams and rivers — protected within the Atewa Range Forest Reserve perform valuable **ecosystem services**. Protecting the plants and animals that live in the Atewa forest is more important to your daily life than you may realize. The Atewa ecosystem:

- Atewa provides most water used by the Kibi region, and a large portion of water used by the Accra metropolitan area.
- Keeps the soil in place so that it does not clog the waterways.
- Absorbs rainfall, filters and slowly releases water into the rivers and streams for us and all of the animals to drink.
- Produces and cleans the air we breathe.
- Provides wood and other products for our homes, clothing, rope, and baskets, among other things.
- Is the source of both traditional and modern medicines.
- Provides a home to many animal and plant species.
- Influences the climate of the Kibi region, including when the rain comes and how long the dry season will last.

Challenges for the conservation of Atewa

Despite its designations over the years as a protected area for biodiversity and watershed services, Atewa has been significantly impacted by humans. Intensive agriculture has led to leaching and loss of soil fertility in parts of Atewa. In some villages, deep channels have been created by surface water running over ground lacking plant cover.

Illegal logging has been a major issue in Atewa, especially during the 1990s, leading to further problems with erosion throughout the area. Unsustainable exploitation of forested areas, coupled with the relatively high frequency of bush fires, has resulted in the depletion of important timber species. Trees such as Mahogany, Odum, Obeche, and Emire, which were abundant before the 1960s, are now locally rare.

Mining activities by unlicensed individuals and groups are increasing and causing serious problems for communities. Major pollution, as a result of improper mining practices, occurs downstream from water bodies along whose banks mining takes place.

Animal populations, especially those of larger mammals, suffer seriously from illegal hunting. About 15% of the bushmeat found in the markets in Accra and Kumasi comes from the Atewa forest. Most of the species sold are wholly protected in Ghana (including the Black-and-white colobus, Spotted palm civet, Giant and Long-tailed pangolins). In addition, some traditional sacred animals (totems) such as Crested porcupine are being hunted and sold. Hunters illegally entering Atewa are known to use automatic rifles, poisonous chemicals, traps and fires. These activities have negative impacts on the villages surrounding Atewa, and local communities should discourage their members from buying food obtained this way.

The future of Atewa- it's in your hands

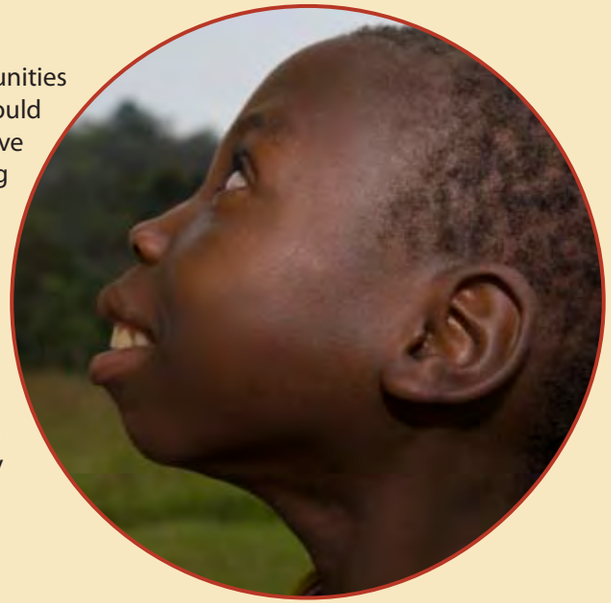
Protection of the unique forests and species in Atewa rests in the hands of the people of Ghana. The value of Atewa lies not only in the presence of rare or threatened species within its forest and the clean water produced by the watershed, but also in being a unique and a very complex ecosystem, one with a combination of species found nowhere else on the planet. Conservation International and its partners recommend the following conservation actions:

Protection

First, the Government of Ghana should delimit and establish an integrally protected area with high protection status, such as a National Park, that includes all remaining intact Upland Evergreen forest, especially on the plateaus. A buffer zone covering the more disturbed slopes and valleys of the reserve should be established surrounding the core protected area within which sustainable use is permitted. The entire extent of Atewa's Upland Evergreen forest must be protected because focusing conservation effort on only a part of the range (such as only the northern part) would lead to greater fragmentation of this unique forest habitat, loss of its function as a biodiversity corridor, and, ultimately, the likely loss of many of its species due to micoclimatic changes caused by diminishing forest coverage and invasion of savanna species into the reserve.

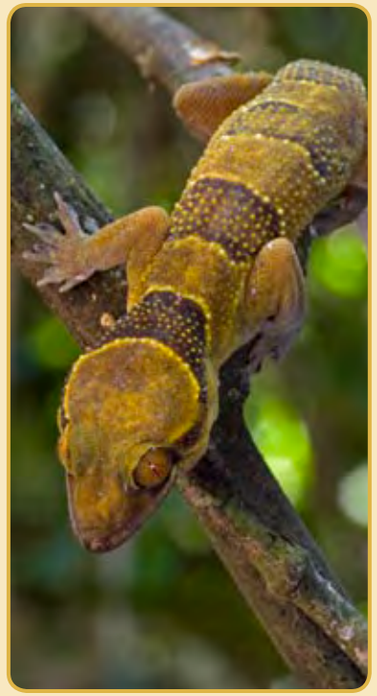
Sustainability

At the same time, alternative income opportunities for local communities in and around Atewa should be explored to reduce dependence on extractive industries and forest products (including bushmeat) from Atewa.



Possibilities include:

1. Ecotourism is likely the best option for bringing income to the region, particularly to Kibi, by transforming the Atewa forest into a world-class ecotourism center, which will focus on the rare and beautiful species identified during the RAP survey and other studies.



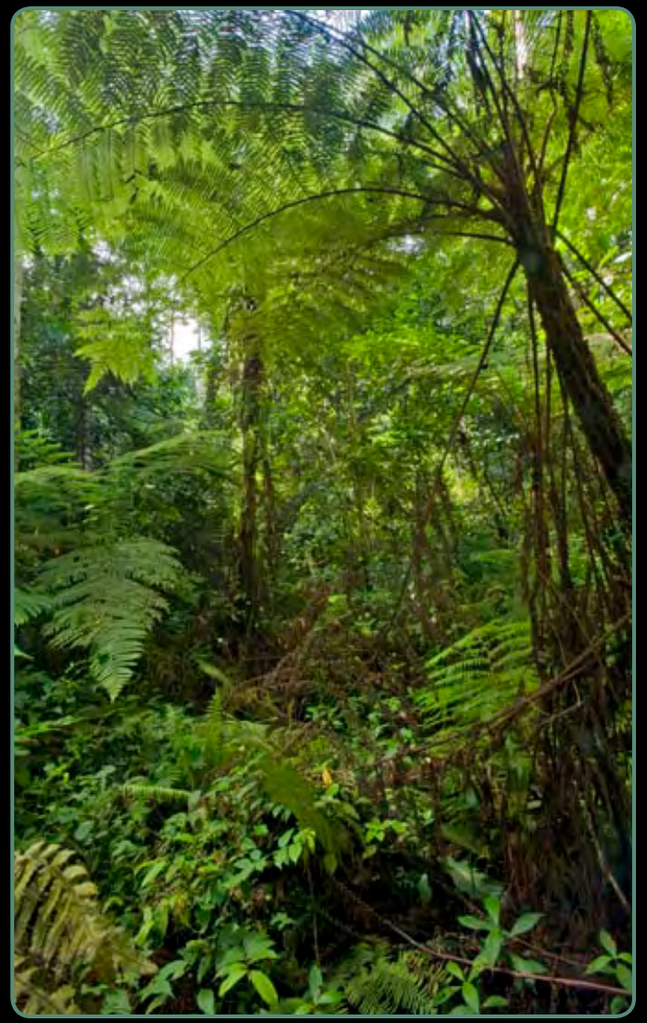
2. To facilitate Ecotourism, a Multi-use Biodiversity Center could be established at the edge of Atewa so that visitors have easy access to the forest and can enjoy the cooler climate provided by the forest. It should be located near to Kibi or other villages so they also benefit from tourist visits by providing lodging, food, handicrafts, guides, etc. The Multi-use Center could be used as all of the following:
   - Research station to facilitate research of Atewa and surroundings by Ghanaian and international scientists, promote collaborations, and train biology and natural resource management students;
   - Tourist/visitor center to bring ecotourism to Atewa and provide information about its biodiversity to visitors and residents;
   - Education center to raise awareness of the uniqueness and importance of Atewa: provide classes and training for local communities, jobs for local residents as interpreters and teachers, and opportunities for local and national schoolchildren to spend a night in the rainforest;
   - Spiritual retreat for the Christian community and/or other local religions to have a place to get away to meet together; both Ghanaian and international Christian groups could use the center as a quiet and spiritual meeting place;
   - Sustainable employment opportunity for local community members as builders, managers, maintenance and housekeeping, tour guides, researchers, and research assistants.

3. Other potential alternative-income industries:
   - Butterfly farming - sale of live butterfly pupae to the global market;
   - Beekeeping - producing honey for local consumption and for sale;
   - Farming of native ornamental fishes for the aquarium trade;
   - Producing products for the tourist trade such as baskets, Kente cloth weavings, or wood carvings;
   - Alternatives to bushmeat hunting, such as raising other types of animals for meat.

Biodiversity of Atewa: Plants

There are more than 425,000 different types of plants in the world. Plants need water, air, and sunlight to live. Plants are divided into two main groups, flowering and non-flowering. Most of the plants around us are flowering plants. Flowering plants have roots, stems, leaves, flowers, and fruits.

The Atewa Range Forest Reserve is part of a ecosystem known as the Upper Guinea Forest. This type of forest ranks among the world's 34 most important biodiversity **Hotspots.** The Atewa Range plant communities are classified by botanists as Upland Evergreen forest. Atewa is one of only two such forests in Ghana, and is known to be very rich and unique. There are 765 different species of vascular plants known from Atewa, including 106 Upper Guinea **endemic species**. No other place in the world has this rich combination of plants species and biological communities.



Many of Atewa's plants are used by surrounding communities in medicine, as food, or as building materials. Unfortunately, unregulated, illegal logging poses a serious threat to survival of many parts of the Atewa forest.

Tree fern *(Cyathea manniana)*

A large terrestrial fern, which can grow up to 8 m high, with individual fronds ("leaves") as long as 3.4 m. This species is very rare in West Africa, and occurs only in cool, humid places at higher elevations, up to 2000 m above sea level. In Atewa it is found in wet places along forest streams.

Grains of Paradise *(Afromomum* spp.*)*

These plants grow on the floor of the forest, and can be seen as large, beautiful white flowers, or large, red fruits that appear to sprout directly from the soil. Their shoots and fruits are eaten by many species of wildlife, and are used in medicine and as spices.

Earthstar fungus (*Geastrum* sp.)

A beautiful fungus, with a fruiting body resembling a star. The "petals" of the earthstar protect the softer, round spore sack during dry weather, but open up and curl backwards when moistened, lifting up the spore sack, and allowing the fungus to release spores more effectively. A single drop of rain or an animal accidentally touching the spore sack causes a cloud of spores to be released into the air, which allows the species to colonize another patch of the forest floor.

Insects and Other Invertebrates

Despite their small size, insects and other invertebrates are the most important animals in the Atewa forests. They provide a number of invaluable ecological services, such as pollination of plants, soil production and fertilization, removal of organic waste, and providing food for most vertebrates, such as frogs, lizards, birds, and many mammals. Insects are also some of the most successful organisms on the planet, occurring in virtually all terrestrial and aquatic habitats. There are over a million species of insects known, but many more remain undiscovered. The forests of Atewa harbor probably tens of thousands of species of insects and other invertebrates, some still unknown to science. Recent scientific expeditions to Atewa discovered several new species of butterflies, katydids, dragonflies, and other small animals.

Almost all insects and other invertebrates are completely harmless to humans, and only very few species transmit diseases, such as malaria. Even most scorpions and spiders are harmless, and their sting is no more dangerous than the sting of a common bee. But many insects are beautiful, and rival birds in their colors and shapes . Atewa is a place where one can see some of Africa's most spectacular butterflies.

Atewa Dotted Border *(Mylothris atewa)* is a slow flying butterfly, which advertises its unpalatable body with white coloration. This is one of the rarest butterflies in Africa, known only from Atewa. It is considered to be a **Critically Endangered species**.

Green-orange Forester *(Euphaedra zampa)* is a shy, solitary butterfly that prefers wetter parts of a forest in good condition. In this species males and females differ in their coloration: males are mostly green, whereas females have large red patches on their wings. This butterfly is a powerful flier, but is found only in West African forests west of Dahomey Gap.

African Leaf Butterfly *(Kallimodes rumia)* is a very convincing mimic of dry leaves. This species can often be seen sipping sap from injured trees. In fact, these butterflies sometimes get drunk when sipping sap from palm trees tapped for toddy (palm wine)!

Driver ants *(Dorylus* sp.*)*

Ants are the most common and visible animals in the forest, and their combined mass is equal to that of all mammals. Ants live in complex societies, which can have thousands or even millions of workers. These workers take care of the single queen, who can live for many years and lay millions of eggs. Ants feed on many different things: some are predators and hunt other insects, some feed on seeds and flowers, while others are **omnivores.** Ants perform many helpful services in the forest: they remove dead animals, disperse seeds, and improve the conditions of the soil.

Driver ants are unusual because they never build permanent nests. They are always on the run, scouting the forest floor in search of insects and other animals they hunt. The large, aggressive soldiers stay on the margins of the column and protect it from predators, catching any organisms unlucky enough to be overrun by the ants.

Insects and Other Invertebrates

Termites

Like ants, termites also form large, complex societies, where each member performs a specific function. While often called "white ants", termites are not related to ants, and are close relatives of cockroaches and preying mantids. Termites play an exceedingly important role in the forests of Atewa, recycling old wood and introducing both nutrients and oxygen to the soil, improving its fertility. Some species build nests high in the forest canopy, but others, like *Cubitermes*, build exquisite, mushroom-shaped structures on the forest floor.

Dragonflies and damselflies are the insect equivalents of hawks and eagles. They are aerial predators, using their excellent vision to spot mosquitoes and other small insects or spiders. They develop in water and their sensitivity to pollution makes them very sensitive indicators of water quality. Atewa and its watershed have a remarkably rich fauna of dragonflies and damselflies, with 72 recorded species. Some of them are rare and threatened, and many occur nowhere else in the country, confirming the unique status of this high elevation habitat.

The Julia Skimmer *(Orthetrum julia)* is widely distributed all across Africa, and is also common in Atewa forests, where it can be found both along forest edges, and deep under the forest canopy.

The Moss katydid *(Polyglochin peculiaris)* is one of the rarest African katydids, being known only from Atewa and a single location in Sierra Leone. This species depends on the presence of humid, undisturbed forest, with thick layers of mosses.

Katydids are critically important members of forest ecosystems. They act as predators, **herbivores**, and **pollinators.** Many are also the principal food of birds, monkeys, bats, and other small predators. The Atewa forests have an exceptionally rich fauna of katydids, with the highest number of species (over 60) recorded from any site in Africa. Many species of katydids recently found in Atewa are new to science, and some may occur nowhere else.

The Leaf katydid *(Musitus afzelii)* is a superb mimic of leaves, on which it feeds. During the day these insects usually sit upside down on large leaves, their flattened bodies virtually indistinguishable from the plant. At night males of this katydid sing a loud, melodious song that attracts females of their species.

Insects and Other Invertebrates

Whip scorpions (*Daemon* sp.) look quite frightening, but are completely harmless. Unlike their cousins, spiders, they have no venom glands, and rely on the swift action of their long, spiky appendages to catch their prey. They feed mostly on crickets and other insects. Whip scorpions are great parents, and the female carries her newly hatched young on her back. Once the young scorpions leave her back she often stays with her children for a while to help protect them from predators.

Giant African scorpion *(Pandinus imperator)*

The largest scorpion in the world, the Giant African scorpion *(Pandinus imperator)*, is still a common species in Atewa. But its size, which can reach 20 cm, and ferocious appearance are misleading – this species is completely harmless. Like all scorpions, the Giant African scorpion has a venom gland at the end of its "tail" (=telson), but its sting is less harmful than that of a bee. The pain from the sting is very mild, and usually disappears after a few minutes without any harmful effects. Not surprisingly, this species is very popular in the pet trade, and every year thousands are exported from Ghana to feed the demand in Europe and North America. Because of this, many populations of Giant scorpions have been severely reduced, and the trade in this species is now internationally regulated.

The clean streams of Atewa are home to several species of freshwater crabs *(Liberonautes)*. While some species are still common, many African freshwater crabs are threatened, and their ranges are restricted to single streams or ponds. Freshwater crabs spend most of their time in the water, feeding mostly on small aquatic invertebrates, but they can also be seen scurrying the forest floor, looking for insects and fruits. While they breathe using gills, and most enter water periodically, their bodies are well sealed and can withstand being on land for many days.

The Giant Ghana snail *(Achatina achatina)* is the largest land snail in the world, in some cases reaching the shell length of 30 cm. Unfortunately this species is becoming increasingly rare. Unlike other land snails it has a long reproductive cycle (at least 3 years needed to reach maturity), and requires dense forests to live and breed. In Ghana it is considered a delicacy, and is frequently overharvested. Recent introduction of the Eastern Giant snail *(A. fulica)*, which can be easily bred in captivity, may help the Giant Ghana snail survive in Atewa and other places.

The streams of Atewa are still relatively clean and undisturbed, and show relatively low fish species diversity, which is typical of undisturbed forests. Sixteen species of fish have been recorded from Atewa, some of which have a great potential in the aquarium trade, and could be **sustainably** harvested.

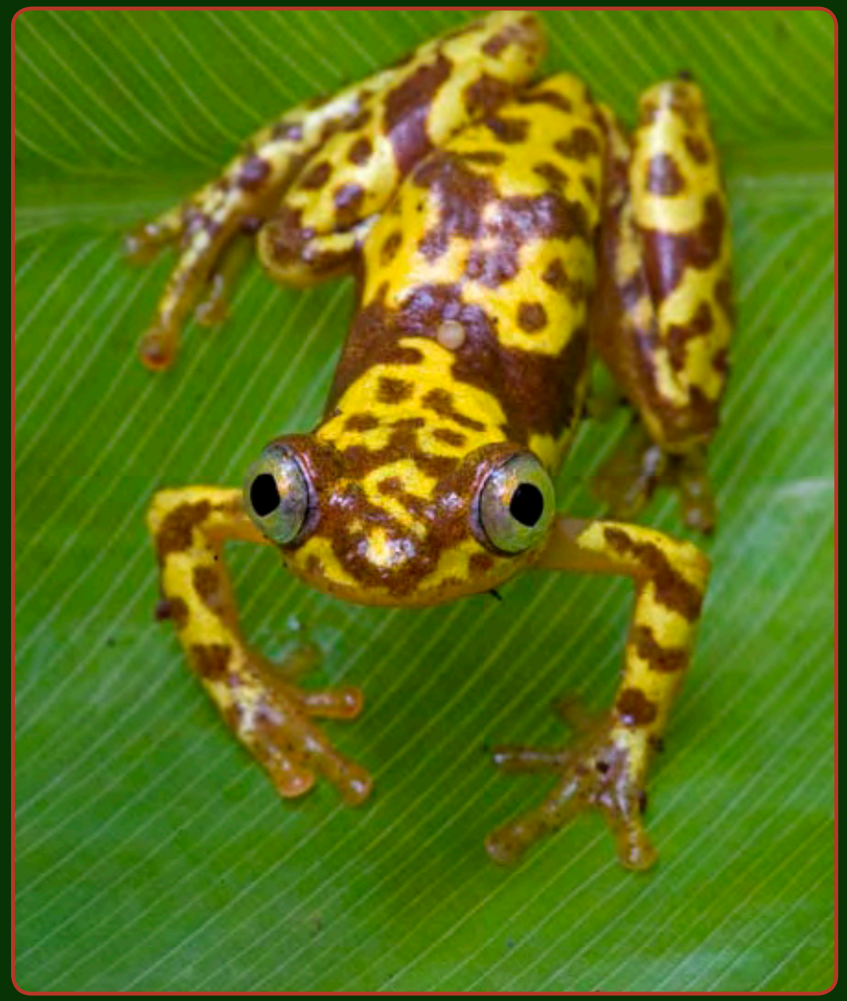
Killfish *(Epiplatys chaperi)* is a small, colorful fish, very popular in the aquarium trade. This species is highly territorial, and quite aggressive towards other fish, even of the same species.

African tetra *(Micralestes occidentalis)* is a little-known fish, typical of forest streams where it feeds on plant parts and insects that fall into the water from the forest canopy. This feeding behavior is typical of fish living in undisturbed rainforest streams where **primary productivity** in the water is very low.

Blackstripe barb *(Barbus macrop)* is a common fish in Atewa streams, but little is known about its biology.

Walker's barb *(Barbus walkeri)* can be easily distinguished from other fish in Atewa streams by dark spots on the sides of the body. This species is often sold as an aquarium fish.

The amphibian fauna of Atewa, which includes frogs, toads, and legless, snake-like caecilians, is rich and unique. Over 30 species are known from Atewa, and all are typical of healthy, undisturbed forests. Almost a third of all amphibian species in Atewa are considered threatened, and their populations in this forest are some of the last ones remaining in the world. Amphibians play an important role in the forest habitats of Atewa, both as predators of insects and other small organisms, and as food for reptiles, birds, and mammals.



Painted yellow frog *(Afrixalus vibekensis)*

The Atewa population of this handsome little frog represents the easternmost record of this species in Africa. Its bright, conspicuous coloration probably indicates toxic properties of its skin, making it safe from such predators as birds and lizards.

Tree frogs *(Chiromantis rufescens)* have an interesting, complex breeding behavior. They build large **arboreal** foam nests, placed on branches above small bodies of water. Their eggs develop in the nest, safe from predators, until young tadpoles are ready to hatch and begin independent life. After hatching, the tadpoles drop into the water below and start feeding on algae. They stay in the water until they develop into small froglets, which climb the nearest trees and never enter water again.

Stream frog *(Conraua derooi)*

This **Critically Endangered species** is known only from a handful of localities in Ghana and Togo, but in recent years its occurrence has been confirmed only in Atewa. There are fears that it may already be extinct elsewhere. Stream frogs require clean forest streams in undisturbed forests, conditions that are becoming exceedingly difficult to find. This frog spends most of its life in the water, hunting insects and other small animals.

Leopard running frog *(Kassina arboricola)*

As the name implies, these frogs rarely jump, preferring to run on their long, beautifully colored legs. Males of this frog call for females from large, well vegetated pools at forest edges or in secondary forests.

Reptiles include lizards, snakes, turtles, tortoises, and caiman. Their skin has scales and they are cold-blooded. They have claws on their toes, except for snakes and legless lizards. Some reptiles lay eggs with hard leathery shells while others give birth to live young.

While the reptiles of Atewa have never been systematically surveyed, it is clear that its forests harbor an interesting and diverse fauna of these animals. While a few species of snakes occurring in Atewa are venomous and should be treated with respect, most reptiles living there are completely harmless. All reptile species are highly beneficial for the forest ecosystem and the surrounding areas by controlling rodent and insect populations. Many reptiles are becoming rare because of the loss of their habitats, and are now considered threatened.

Horned viper *(Bitis nasicornis)* is undoubtedly one of the most beautifully colored snakes in Africa. Yet this seemingly conspicuous coloration is a perfect camouflage when it waits for its prey on the forest floor, among multicolored, fallen leaves. These vipers can reach the length of about 1 m, but their bodies are thick and muscular, making them appear even larger. They are not aggressive, but can deliver a very dangerous, potentially lethal bite, and if encountered in the forest should only be admired from a distance.

Green tree viper *(Atheris chloraechis)*

This long, slender snake is almost completely arboreal, and is nearly impossible to find as its green coloration allows it to blend perfectly into surrounding vegetation. Green tree vipers feed on lizards and rodents. This species is venomous, but is not aggressive and not considered dangerous.

Forest chameleons *(Chamaeleo gracilis)* are common in Atewa, but thanks to their extraordinary ability to change color to match their surroundings, nearly impossible to spot. These innocent and completely harmless lizards use an unusual hunting technique, catching insects with an incredibly long, sticky tongue, which they can shoot out with amazing speed.

Birds

The Atewa Range Forest Reserve is one of the most important bird sites in Africa. It is classified as an Important Bird Area, with over 150 species recorded within its borders. Six of these species are of conservation concern, being ranked as either **Vulnerable** or **Near Threatened**, and one species (Nimba Flycatcher) occurs nowhere else in Ghana.

Birds are vital members of this forest community. They are primary seed dispersers, and many tree species would not be able to reproduce without birds' help. Many birds are **insectivores**, keeping in check populations of plant-eating insects, and stopping their populations from excessive growth. Large birds, such as hawks and eagles, are predators of vertebrates as well as removers of carrion. Birds are also themselves food for other organisms, such as civets or even some primates. Unfortunately, removal of old growth trees from Atewa has made a significant impact on many bird species, especially those that rely on large, tall trees for their nesting sites. Grey parrots, once common in Atewa, are no longer found there. Hopefully, aggressive conservation measures, which should include a complete halting of logging, may bring at least some of the lost species back to Atewa's forests.

White-crested Hornbill *(Tropicranus albocristatus)* is a small hornbill, widely distributed in West and Central Africa. It can be seen in pairs or small groups in mature and secondary forest. These birds often join mixed flocks of other birds, and even associate with monkeys, catching small animals flushed out by these mammals. Like all hornbills, this species nests in hollows of forest trees, and the female is imprisoned in the nest during the entire incubation period, feeding on food delivered by her mate.

Red-bellied Paradise Flycatcher *(Terpisphone rufiventer)* is a beautifully colored bird, with a long tail. It usually forages singly or in family groups, and often joins mixed species flocks of birds. The nest of this species resembles a small cup made of moss, lined with fiber, and placed in the fork of a tree.

Blue-headed Bee-eaters *(Merops muelleri)* can be seen perched on lianas in the middle of the Atewa forest. Like all bee-eaters, these birds feed mostly on bees and other insects, which they catch during a circular flight from the perch, or during extended, cruising flights. They nest in burrows excavated on vertical river banks.

Blue-breasted Kingfisher *(Halcyon malimbica)* is unusual in that its diet consists mostly of insects and not fish as in other species of kingfishers. They nest in termite nests high in the trees.

Mammals

The forests of Atewa are home to a wide range of rare and threatened forest mammal species. Over 40 species have been recorded from Atewa, including 6 species of primates (monkeys and bush babies), pangolins, civets, and duikers. Unfortunately, these species have suffered greatly from negative changes to their habitat caused by both selective logging and construction of roads and, more importantly, widespread, illegal bushmeat hunting. By working together, local communities and authorities can monitor mammal populations to prevent the local extinction of threatened species in Atewa, and halt illegal and unregulated hunting and logging.

Fruit bat *(Myonycteris torquata)*

Fruit bats in Atewa play a very important role as both **pollinators** and seed dispersers. Unlike most smaller bat species, which feed mostly on insects and other small animals, fruit bats are strictly **herbivorous.** They eat ripe fruits and drink flower nectar. Because their food is stationary, fruit bats do not use **echolocation**, but instead rely on their good vision and sense of smell to find their feeding grounds.

Campbell's monkey *(Cercopithecus campbelli)* occurs from Gambia to Ghana. These primates forage during the day, eating mostly fruits and seeds, but occasionally catching small animals, including birds and their eggs. Their foraging ranges are small, and the troop usually stays within a core area smaller than 3 hectares.

Geoffroy's pied colobus *(Colobus vellerosus)* is one of the most threatened primates in Africa. They have been recorded from Ivory Coast to SW Nigeria, but are never common. These monkeys feed primarily on leaves, but during certain seasons also eat fruits and flowers.

Glossary

Arboreal – lives in trees

Critically Endangered species – of the four internationally recognized categories for high risk of extinction (Critically Endangered, Endangered, **Vulnerable**, and **Near Threatened**), Critically Endangered species have the highest risk of extinction in the world. Endangered, Vulnerable and Near Threatened species are still at high risk of extinction but to lesser degrees, respectively

Echolocation – navigating or locating objects by sending out sound waves and listening to the echo

Ecosystem – a community of plants, animals and habitats together with the interrelated physical and chemical environment

Ecosystem service – Services provided by ecosystems that benefit all living beings, especially humans, and are necessary for a healthy planet like oxygen production, water purification, pollination, soil formation and nutrient recycling

Endemic species – a species that is naturally found only in its place or region and nowhere else in the world

Herbivore, herbivorous – an organism that feeds solely on plants

Hotspot – a region with high levels of biodiversity, endemism and threat

Insectivore – an organism that feeds on insects

Omnivore – an organism that feeds on a variety of food types, both plant and animal

Pollinator – an animal that transfers pollen from one flower to another so that plants can make seeds

Primary productivity – production of organic compounds by plants from atmospheric or aquatic carbon dioxide, using the sun's energy

Sustainably – in a way that does not deplete the resource so it can be used indefinitely

Conservation International

Conservation International (CI) is an international, nonprofit organization based in Arlington, Virginia, USA. CI believes that the Earth's natural heritage must be maintained if future generations are to thrive spiritually, culturally and economically. Our mission is to conserve the Earth's living heritage, our global biodiversity, and to demonstrate that human societies are able to live harmoniously with nature.

Conservation International – Ghana

Conservation International-Ghana's work focuses on preventing species extinction, increasing protection and improving management of Ghana's remaining forest fragments, and developing biodiversity corridors. CI-Ghana's work started in 1990, protecting habitat of globally threatened species from further degradation through innovative ecotourism development in Kakum National Park. To help secure Kakum, CI-Ghana implemented the Cocoa Agro-forestry Programme in partnership with Kuapa Kokoo, assisting cocoa farmers within the Kakum Conservation Area to adopt ecologically sustainable practices for increased production. Recently, CI-Ghana has participated in a two-year nationwide bushmeat campaign to raise awareness of the impacts to biodiversity of the bushmeat trade and, in partnership with the Ministry of Environment and Science, provided support for the completion of the *National Biodiversity Strategy for Ghana*.

Rapid Assessment Program (RAP)

RAP was created by CI in 1990 to address the lack of biological information needed to make quick but sound conservation decisions. RAP sends teams of international and host-country expert scientists to conduct rapid assessments of the biological value of selected areas. RAP findings are analyzed together with social, economic and other ecosystem information to develop a comprehensive conservation strategy. RAP scientists have discovered hundreds of new plant and animal species and provided key biological data on threatened ecosystems around the world.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