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The New Conservation Areas in the Philippines Project (NewCAPP) is a five-year project of the Government of the Philippines with financial support from the Global Environment Facility (GEF) through the United Nations Development Programme (UNDP). It is being implemented by the Protected Areas and Wildlife Bureau (PAWB) of the Department of Environment and Natural Resources (DENR).

Expanding and Diversifying the National System of Terrestrial Protected Areas in the Philippines Project or New Conservation Areas in the Philippines Project

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Peak of Wealth

An inventory and assessment of flora and fauna resources in Mt. Tapulao, which at 2,037 meters above sea level is the highest peak in the Zambales Mountain Ranges, have reaffirmed previous studies that more than half of the total 142 animal species recently studied there are found exclusively in the Philippines, with 17 of which endemic only to Luzon Island and two other species found solely in Mt. Tapulao and nowhere else in the world.

Rats, bats found exclusive in highest Zambales apex

From 9-15 August 2012 and 20 September to 25 October 2012, the team conducted the study in sites located in three towns along the western slope of Mt. Tapulao in Central Luzon facing the West Philippine Sea or South China Sea - the municipality of Palauig, where five study sites were located, and the municipalities of Iba and Masinloc, with one site each. The inventory and assessment study has been conducted in collaboration with the University of the Philippines (UP) Diliman through the UP Institute of Biology and the Diliman Science Research Foundation, and the Protected Areas and Wildlife Bureau (PAWB) of the Department of Environment and Natural Resources (DENR), through the New Conservation Areas in the Philippines Project (NewCAPP).

Dubbed as a sub-center of mammalian diversity on Luzon Island, the stretch of Zambales Mountains is considered a high priority conservation area, according to the group Conservation International and the respective teams of doctors Delfin T. Mallari of the Fauna and Flora International (FFI) and Perry S. Ong of the UP Institute of Biology in previous studies. Currently, there is a proposal to declare the key biodiversity area of the Zambales Mountain Ranges as a protected area, with a total proposed land coverage of 15,690.15 hectares within the three municipalities of Palauig, Botolan, and Iba, encompassing many forest types as well as agricultural areas.

Five forest types were identified in the recent study: tropical semi-evergreen rainforest, tropical lowland evergreen rainforest, tropical lower montane rainforest including the pine forest, tropical upper montane rainforest, and tropical sub-alpine forest.

“These results confirm the relationship between the quality of species assemblages and the different forest types and elevational gradients where they are found,” the inventory and assessment team said in their report. “This should be a key input in the management planning process in the development of Mt. Tapulao as a local conservation area.” The fauna team is composed of Dr. Ong, Mariano Roy M. Duya, Melizar V. Duya, and Mark Vincent C. Yngente, while the flora team is composed of Dr. Ma. Dolores C. Tongco, John Michael M. Galindon, and Franklyn M. Dalin.

The team revealed that a combination of various methods was used to sample the taxonomy of the vertebrates and to document species richness and diversity, such as mist netting for birds and bats, cage trapping of small mammals, and line transect surveys for birds, amphibians, and reptiles.

A total of 142 species composed of 9 amphibians, 19 reptiles, 28 mammals, and 86 birds were recorded during the study in Mt Tapulao, of which more than half were endemic to the country. Of this 55 percent, 17 species were endemic to Luzon Island and another two species found only in Mt. Tapulao and nowhere else in the world. These two species of murid rodents were the Tapulao shrew rat (*Rhynchomys tapulao*) and Brown’s forest mouse (*Apomys brownorum*). The Tapulao shrew rat was caught only in the tropical upper montane rainforest between 1820m and 2035m while the Brown’s forest mouse was caught over a wider range of elevation, from 600m to 2035m.

As for the bats, the Mottled winged flying fox (*Desmalopex leucopterus*) and the Orange-fingered myotis (*Myotis rufopictus*) were the two bat species collected for the first time within the Mt. Tapulao range. The Mottled winged flying fox was caught in the tropical lowland evergreen rainforest of Iba and tropical semi-evergreen rainforest (forest fragment) in Masinloc, while the Orange-fingered myotis was caught in the tropical upper montane rainforest of Palauig at 2035m. The capture of both bat species represented a new distribution record for Zambales, while the capture of the Orange-fingered myotis represented new elevational distribution for the species, the study emphasized.

Among the birds, the team documented three species which the International Union for the Conservation of Nature (IUCN) has categorized as vulnerable. These are the Flame-Breasted Fruit Dove (*Ptilinopus marchei*), the Ashy ground-thrush (*Zoothera cinerea*), and the Philippine Eagle Owl (*Bubo philippensis*). None of the species of amphibians and reptiles recorded was under any of the IUCN threat category. “We suspect that some species could represent new species or new records for Luzon Island such as the snake under the genus *Oxyrhabdium* and the forest frog of the genus *Platymantis*, subject to final identification,” the team said in their report.

Species richness of birds, bats, amphibians, and reptiles was reportedly highest in the tropical lowland evergreen rainforest between 600m and 896m, while species richness of small mammals such as rodents increased with elevation. But one notable exception was that of a bat species, the Luzon endemic Luzon Pygmy Fruit bat (*Otopteropus cartilagonodus*), where their relative abundance increased with elevation. Another exceptional pattern was observed in the Philippine endemic Mountain Forest Frog (*Platymantis cf montanus*), where the species was found only in the tropical lower montane rainforest at 1600m.

Study amidst Habagat

The study commenced on 7 August 2012, but the team was only able to climb the mountain on 10 August 2012 because of the continuous heavy rains due to the then Habagat (southwest monsoon) phenomenon. Between 10 and 15 August, the team was only able to conduct the study equivalent to two days’ work because of continuous heavy rains. For safety reasons, the team was forced to evacuate from the camp site and abandon the scheduled study. During this period, the team effectively lost 10 working days and managed to get limited information only in the 1820 meters above sea level (masl) elevation for the fauna and only the 1600 masl for the flora team.

In terms of plant diversity, a total of 304 species and morpho-species of plants were recorded using the variable transect method, of which 34 percent (102 species) were identified to the species level. Of these, 40 percent (41 species) were endemic to the Philippines and 6 percent (6 species) restricted only to Luzon island. Another 33 species of plants were collected in the vicinity of the transects. Of these, six species were Philippine endemics and another four species were Luzon endemics.

Moreover, a total of 14 species in the transects and another three species in its vicinity were listed as threatened, with one species – *Tristaniopsis decorticata*, locally called *Malabayabas* – being critically endangered. Of these threatened species, 11 species were endemics, of which two were found outside the transects. The study said pitcher plants and orchids abound in the sampling areas, dubbed species of interest as they were highly valued by plant collectors and enthusiasts. “Specific conservation measures should be put in place to ensure that their utilization will not lead to over-exploitation,” the team added.

When developing management programs for Mt. Tapulao, the team said, all forest types should be given equal importance as different forest types would protect a specific assemblage of plants and animals. “There is a risk that survival of certain assemblage of plants and animals might be jeopardized if the implication of these results is not realized at the onset,” the team stressed. It said the results of the inventory and assessment had demonstrated that different species have different habitat preferences, as some species were observed to be abundant in certain habitat/elevations than others while other species are restricted to certain elevations or habitats.



“Our data on the diversity and abundance of small mammals in Mt. Tapulao support the prediction that the presence of native non-volant mammals in old growth or disturbed forest habitats prevents the intrusion of non-native non-volant mammals into the forest,” the team said. Bats and flying squirrels are generally classified as flying or volant mammals, while rats and other terrestrial mammals are classified as non-volant.

On amphibian species richness and relative abundance, a total of nine species of amphibians were collected. Of these, only two were not endemic to the Philippines, while three species are Philippine endemic and another four species are confined only to Luzon island. The most common species encountered were Luzon endemics Luzon Stream Frog (*Hylarana similis*) and Luzon Fanged Frog (*Limnonectes macrocephalus*), both found only in elevation between 218 and 845m and associated with water bodies. The Philippine endemic species Mountain Forest Frog (*Philautus cf montanus*) was captured/observed only at 1290 and 1690m, while the Kalinga Narrowmouth Frog (*Kaloula kalingensis*) was found from 845m to 1901m.

On reptile species richness and relative abundance, a total of 19 species of reptiles were documented. Of these, 3 were non-endemic, 11 were Philippine endemics, while another 2 found only on Luzon island. Three species of snakes needed further identification by comparing it with existing known species in the country. The team said it was not possible to estimate the relative abundance of snakes and lizard because of the small sample size. Instead, the team plotted the number of individuals encountered per elevation to determine species richness along different elevations.

Among the lizards and skinks, the most common was the Philippine endemic Black-sided Sphenomorphus (*Parvosцинus decipiens*) and the Luzon endemic Boying’s Zambales Mountain skink (*Parvosцинus boyingi*). As for snakes, the most commonly encountered was the Shrub Snake (*Oxyrhabdium sp*, family Lamprophiidae). The most number of lizards was observed at elevation between 840m and 1290m and at 217m while species richness of snake was highest in the tropical lower montane forest at 1286m.

Rats and rodents

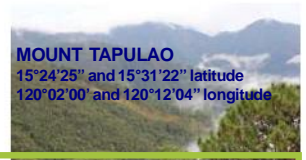
Moreover, the team documented a total of 28 species of mammals which included 9 species of rodents, 7 species of fruit bats, 7 species of insectivorous bats, 2 species of shrews, 1 Philippine deer (*Cervus marianus*), 1 non-endemic civet cat or Common palm civet (*Paradoxurus hermaphroditus*), and 1 endemic wild pig or Philippine warty pig (*Sus philippinensis*). Among these, 61 percent are endemic to the Philippines where four species (3 rodents and 1 fruit bat) are endemic to Luzon Island and two rodents endemic to Mt. Tapulao.

The most common species of small mammals, the site endemic Brown’s forest mouse (*Apomys brownorum*), was found from 600m to 2005m. The least common was the site endemic Tapulao shrew rat (*Rhynchomys tapulao*) represented only by one individual and was caught only at 2005m.

The Luzon endemic Large Luzon forest rat (*Bullimus luzonicus*) was only found at 600m to 1403m and was most common at 896m, while the Philippine endemic Common Philippine Forest rat (*Rattus everetti*) has a much wider range and was found from 213m to 1820m. The Philippine endemic Lowland striped shrew rat (*Chrotomys mindorensis*) was found at 213m and 600m, although the species was previously recorded at 1600m, thus its elevational distribution overlapped with the Large Luzon forest rat and the Common Philippine Forest rat.

The presence of non-native species in high elevations could be attributed to the presence of the old mining roads. Non-native species of rodents such as the Asian house shrew (*Suncus murinus*) and Polynesian rat (*Rattus exulans*) were recorded at 213m and 1403m, while an individual Asian house shrew was caught by hand at 1700m along an old mining road and individuals caught at 1403m were in traps placed at the edge of the forest.

“Although non-native small mammals were recorded at 1400m and 1700m where tropical lower montane rainforest is relatively intact, its presence at higher elevation was limited to areas where man-made disturbance such as the mining road is present. But none of the non-native rodents were caught inside the forest where native species are abundant,” the report said.



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It added: "This further emphasizes the importance of maintaining the different forest types within the mountain range. It is therefore recommended that all forest areas above 800m should be placed under protection to prevent further degradation of the forest brought by unsustainable anthropogenic activities whereas forest fragments and remnant lowland forests between 600 and 800m should be placed as habitat restoration zone and forest restoration activities should be a priority activity."

Bats and birds

Unlike rodents, species richness of bats and relative abundance of fruit bats decreased with elevation except for the Luzon endemic Luzon Pygmy Fruit bat (*Otopteropus cartilagonodus*) between 1200m and 2035m, where species abundance increased with elevation. Philippine endemic species of bats such as the Musky Fruit bat (*Ptenochirus jagori*) were found between 213m and 1200m, while the Fischer's pygmy fruit bat (*Haplonycteris fischeri*) was found only at 896m.

An individual Philippine endemic Mottled winged flying fox (*Desmalopex leucopterus*) was captured at 230m and 896m, representing a new distribution record for the species. Non-endemic species of fruit bats such as the Short nosed fruit bat (*Cynopterus brachyotis*) and the Common rousette (*Rousettus amplexicaudatus*) was more wide spread, both captured at 230m to 2035m, while the Dagger toothed flower bat (*Macroglossus minimus*) were found only at 600m and 896m.

For insectivorous bats, two individuals of Orange Fingered Myotis bat species (*Myotis rufopictus*), a Philippine endemic poorly known and found only at elevations between 50m and 1465m, were captured at 1800m, representing a new elevational range distribution for the species.

The team recorded a total of 86 species of birds along the different elevational gradient sampled from 213m to 2035m. This included 34 Philippine endemic species and another 7 Luzon endemic species, which comprise 48 percent of the total avian species recorded. Among the bird species recorded, three species were categorized by IUCN as vulnerable - the Flame-Breasted Fruit Dove (*Ptilinopus marchei*), Ashy ground-thrush (*Zoothera cinerea*), and the Philippine Eagle Owl (*Bubo philippensis*) - and one categorized as near threatened - the Rufous hornbill (*Buceros hydrocorax*). Endemicity was highest in the tropical lowland evergreen rainforest, comprising between 54 and 72 percent of the total species observed.

The most abundant species across all the study sites was the country endemic Philippine bulbul (*Hypsipetes philippinus*), while the abundance of other species varied per elevation. The Philippine Coucal (*Centropus viridis*), another Philippine endemic, was the second most common in the lowland tropical semi evergreen forest (forest fragment) at 213m, while the Philippine Tailorbird (*Orthotomus castaneiceps*) and the Balicassiao (*Dicrurus balicassius*) were the second most common in the tropical lowland evergreen forest between 600 and 896m. The Green-backed whistler (*Pachycephala albiventris*) and the Elegant tit (*Parus elegans*) were the second most common in the tropical lower and upper montane and sub-alpine forest, respectively. The Philippine Eagle Owl, the Rufous hornbill, and the Furtive flycatcher (*Ficedula disposita*) were found only in the tropical lowland evergreen forest between 600 and 896m, while the Flame-Breasted Fruit Dove was found only in the tropical lower montane forest between 1200 and 1400m.

Another 17 endemic bird species are restricted only to the tropical lowland evergreen forest from 213m to 896m, and six species found only in the tropical lower and upper montane and sub-alpine forest. Other species found across all sites included the Green-backed whistler, the Elegant tit, and the Blue-headed fantail (*Rhipidura cyaniceps*). Bird diversity and endemism were greatest in the mid elevation where there is a relatively good stand of forest. Although the number of species of birds in the tropical lowland semi-evergreen (forest fragment) at 213m was greater compared to all other sites, endemicity was generally low and most of the species present are either widespread endemics or non-endemic species, while the number of endemic species in the tropical lower and upper montane and sub-alpine forest was low. But some species are restricted only to either tropical lower and upper montane or sub-alpine forest, such as the Mountain tailor bird (*Orthotomus cuculatus*) and the Flame-Breasted Fruit Dove.

"Finally and more importantly, awareness on the importance and benefits of Mt. Tapulao by offsite and onsite local communities should be enhanced to prevent hunting and the gathering of wild plants as well as increase the community's appreciation of the importance of the forests of Mt. Tapulao and its flora and fauna as well as their participation in its protection and conservation," the FFI report said in its recommendation.

NewCAPP role

Aside from the conduct of this biodiversity assessment, NewCAPP through the DENR-III regional office has been involved in the management planning and eventual establishment of a Local Conservation Area (LCA) in Mt. Tapulao, in cooperation with the local governments of Palauig, Iba, and Masinloc.

The aim is to cover the whole of Mt. Tapulao through a memorandum of agreement declaring it as an LCA, which the DENR and the three local governments will co-manage.