

Ecology and conservation of Philippine Eagles

Dennis J. I. SALVADOR[#] and Jayson C. IBANEZ

Philippine Eagle Foundation, VAL Learning Village, Ruby St. Marfori Heights, Davao, Philippines 8000

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Abstract The Great Philippine Eagle *Pithecophaga jefferyi* is regarded as one of the most endangered eagles in the world. Habitat loss and human persecution continue to impact the species adversely. These problems are complicated further by a number of human-induced factors. Yet despite these obstacles, sustained conservation initiatives over the years have begun to yield positive results. The current population status of the species and threats are outlined in this report. *In situ* and *ex situ* actions associated with the conservation of the species show how these threats are being addressed. Advances made to further our understanding of the species' biology and ecology are also discussed. With continuing success in the captive propagation of the Philippine Eagle, the program is now in the process of initiating reintroductions. This is anticipated to take Philippine wildlife conservation into its next level. Recent developments and plans to strengthen recovery goals for the species are also presented in this paper.

Key words Conservation, Ecology, Philippine Eagle, Population, Propagation, Reintroduction

The Great Philippine Eagle *Pithecophaga jefferyi* continues to be one of the most endangered birds of prey in the world (Bildstein et al. 1998). Our recent estimate indicates that there are about 200 pairs left in the mountains of Mindanao where most of our efforts have been concentrated. It is believed, however, that there may only be about 500 pairs in the entire country, including those in the less explored historical ranges of Luzon, Leyte and Samar islands (Bueser et al. 2003).

The species is considered “critically endangered” based largely on the premise that such a huge raptor occurs in low numbers, has a low reproduction rate, and requires large forested territories or habitat that is fast disappearing. Although habitat loss is believed to be the ultimate cause, it was not until recently that research established the proximate causes explaining recent population decline. Combining data from recent fieldwork and field notes from the past two decades, it appears that the Philippine Eagles, in Mindanao at least, are breeding fairly well (Miranda et al. 2000). Therefore, the low survival rates of juveniles and subadults and their inability to disperse between forest fragments across inhospitable landscapes may

possibly be the primary factors that are responsible for recent population declines and not breeding failures.

The increasing insularization of forest habitats and the structural transformation of large natural areas may have taken a heavy toll on the species. As forest fragmentation increases contact with humans, Philippine Eagles are rendered vulnerable to shooting, trapping and other forms of persecution.

In the short term, we believe hunting is a major and deadly threat to the species. Out of 11 eagles recovered since 1999, seven sustained gunshot wounds, three were trapped using improvised snares and one nestling was stolen from a nest. Two of these birds did not survive. There are probably more incidents of hunting and trapping that remain unreported. Human persecution can be devastating to a species already on the edge of extinction. Species may be lost altogether even though suitable habitat still remains. But unlike habitat loss, which requires solutions that encompass several generations, hunting and other forms of persecution is a behavioral problem that is reversible in human time scale.

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[#] Corresponding author, E-mail: djis@pltdsl.net

DEFORESTATION AND HABITAT LOSS IN THE PHILIPPINES

Deforestation continues to be the primary threat to the long-term persistence of the species. In the past sixty years, rainforests in the Philippines have been reduced in inverse proportion to human population growth. Although the relationship is complex, the uncontrolled growth of human population seems to have aggravated the threats to the country's remaining forests. These threats include: uncontrolled felling and gathering of forest products, illegal conversion of forest lands, and fire associated with slash-and-burn agriculture (Malayang 2000). But rather than work to aggressively address these threats, the government seems more inclined to downplay the situation.

The Department of Environment and Natural Resources (DENR 1996) claims that only one percent of the total forest was lost to illegal logging in 1993. Yet Malayang (2000) believes that the real figure could be much higher. With so many timber licensing agreements, stewardship projects (IFMA) and industrial tree plantations at that time, cutting violations of even 10 percent by these permit holders in only ten percent of their areas would be equivalent to illegal logging of 19,000 hectares of forest a year. This is extraordinarily high considering that only six million hectares of forest remain in the country (DENR 1996).

It was not until a series of typhoons struck eastern Luzon in December of 2004, that the entire country realized the extent of deforestation in the countryside. As tropical cyclones "Unding", "Violeta", "Winnie", and "Yoyong" came one after the other, the rain-soaked mountains gave way causing landslides and severe flooding. Over 1,000 people and almost 40,000 families were rendered homeless. This tragic incident resulted in further losses to crops, infrastructure, fisheries, schools, and transmission lines amounting to over \$93,600,000. The government promptly banned logging throughout the country but quickly lifted the ban in some areas by March 2005.

Compounding the issue further is the country's unbridled population growth now estimated to be at 84 million people. This exerts further demand and pressure on the country's remaining forests. In Mindanao island where most Philippine Eagle populations occur, the incidence of human poverty is estimated to be at 50 percent with about two-thirds of the people tilling the land to survive (NSCB 2000). Consequently, upland forest areas are continuously har-

vested for timber or opened up for cultivation. Relentless government efforts to mitigate further degradation of the forests, ranging from prevention through social forestry strategies to strengthening enforcement measures, have largely been insufficient and ineffective in stemming deforestation.

In recent years, political instability, the erosion of peace and order conditions in Mindanao and economic uncertainty have adversely impacted conservation initiatives in the Philippines. For organizations like the Philippine Eagle Foundation (PEF), which rely almost exclusively on private contributions to sustain its work, the impact has been severe. While these conditions have admittedly crippled expansion plans, these did not stop the PEF from aggressively pursuing species recovery goals. Perhaps the lack of adequate funding even helped spur the creative use of resources to maximize actions.

This paper presents the progress we have made to help save the Great Philippine Eagle in the context of an operating environment described above. It summarizes our current knowledge on the distribution and ecology of Philippine Eagles and presents a holistic conservation strategy launched in 1987 by PEF. Recent successes of the overall PEF operations are described, including accomplishment highlights for four strategic directions as represented by PEF's four programs namely Field Research, Conservation Breeding, Community-based Initiatives and Education. Future targets are also described at the end of this paper.

DISTRIBUTION AND ECOLOGY

The Philippine Eagle is a huge forest raptor whose historical range includes the islands of Luzon, Leyte, Samar, and Mindanao. Formerly known as birds of mature tropical forests (Rabor 1968), their nests were found in a variety of habitat ranging from old growth forests, to secondary growths, and even within highly disturbed ones. A complete breeding cycle for Philippine Eagles lasts two years and results to a single young (Kennedy 1981, 1985). Primarily because of hunting and habitat loss, the Philippine Eagle is considered one of three most endangered birds of prey in the world (Bildstein et al. 1998).

The Philippine Eagle was discovered by a British naturalist in 1896 on the island of Samar, and was subsequently described as the species *Pithecophaga jefferyi* at the 39th meeting of the British Ornithologist Club (Ogilvie-Grant 1897). Seven decades later, Rabor (1968) alerted the world about the imperiled

status of the Philippine Eagle, citing deforestation and hunting as major reasons for population decline.

In 1969, at the urging of the World Wildlife Fund, the Philippine government declared the bird as protected and established the Monkey-eating Eagle Conservation Program (Kennedy 1977). However, conservation for the species gained ground only during the early 1980's, after the work by Dr. Kennedy and his colleagues on Philippine Eagle distribution and nesting biology (Kennedy 1981, 1985). Films and still photographs on eagles by Kennedy and colleagues became a tool for public education and awareness.

Nearly two decades after its inception, the Monkey-eating eagle Conservation Program evolved into the Philippine Eagle Foundation (PEF), a non-governmental organization working directly for the conservation of the Philippine Eagle in Mindanao. Through field research, captive breeding, community-based conservation, and public education, PEF leads efforts to sustain wild populations, and conserve biodiversity inherent in eagle territories (Salvador 1995).

Most frequently cited information on the behavior and biology of nesting Philippine Eagles was primarily derived from the studies of Kennedy (1985) on several nesting pairs in Mindanao Island. Previously, Gonzales (1968) studied a breeding pair although in a limited fashion. In a recent study of Philippine eagles and its young in an isolated forest, new information on courtship behaviors, adult and juvenile behavior and activity patterns were added to recent knowledge (Afan et al. 2000 Ibanez et al. 2003)

The prey species for Philippine Eagles are mainly mammals, but also include birds and reptiles (Gonzales 1968, Kennedy 1985, Ibanez et al. 2003). A total of 17 vertebrate species were documented as prey, with Flying Lemur *Cynocephalus volans* and Civet Cat *Paradoxurus hermaphroditus* comprising the bulk of the diet. These species are animals of the lowland and montane forest, and are able to persist in disturbed habitats (Heaney et al. 1998).

Although it is clear that the major threat to tropical birds of prey is forest destruction (Thiollay 1989, 1992), it is unclear whether the population decline of the Philippine Eagle is mainly due to reproductive failures or to increased mortality of juveniles or subadults. A recent analysis of reproductive success in the wild revealed that eagles might be breeding well (Miranda et al. 2000). The alternative hypothesis, that juvenile mortality is a major cause of population decline, is recently being tested through radio-telemetry.

CURRENT CONSERVATION EFFORTS

Conservation efforts to save the critically endangered Philippine Eagle have primarily been undertaken by the Philippine Eagle Foundation (PEF). PEF has been working on recovering Philippine Eagle populations using *ex situ* and *in situ* conservation actions. These actions, organized into programs, involve: conservation breeding, education, field research and community-based initiatives.

1) Conservation breeding

Recognizing that current conservation initiatives pale in comparison at which species' endangerment problems escalates, the PEF's breeding program works to accelerate captive propagation of the Philippine Eagle to: 1. offset losses in the wild; 2. augment wild populations in the future; 3. serve as a repository or gene pool of the species while threats that led to its decline in the wild continue to be addressed.

Using only birds confiscated from illegal hunters or traders and those willingly donated to us, we have now reached a threshold where productivity has become fairly consistent and predictable. Overall, we have produced 18 eagles using both cooperative artificial insemination and natural pairing techniques. Three of these captive-bred eagles died: two from congenital anomalies and another died from electrocution nine months after it was released experimentally. Still, we are confident that we can successfully produce at least three eagles annually.

This improved capacity now brings a new set of challenges. Because the primary goal of captive propagation is to reintroduce birds back to their original range, we are now working on experimental releases as a preparatory stage to a full reintroduction program. The first of these test releases was done in Mt. Apo National Park in Mindanao where a hack site was established and protocols developed by the Peregrine Fund for the Harpy Eagle *Harpia harpyja* were tested. Unfortunately, the eagle died of electrocution but not before it had taught us more about juvenile behavior in the wild. This entire effort was widely publicized and brought eagle conservation to national attention. Hopefully, this awareness translates to more grassroots and political support for species recovery goals.

2) Conservation education

Furthering public awareness on the plight of the Philippine Eagle is the domain of our education program. We have launched an aggressive education campaign by working with about 1,700 teachers in

579 schools throughout the archipelago. Focusing on teachers to help educate our children enabled us to reach large numbers of people using limited resources. We complemented this campaign with our Open Classroom Project at the Philippine Eagle Center where elementary and high school students receive lessons on wildlife through workshops and encounters with our animal and plant exhibits. The Philippine Eagle Center continues to be our primary education resource and venue for educating schoolchildren, tourists and visitors on the environment. Additionally, we work actively with the print and broadcast media to promote conservation to the general public and the private sector from whom we elicit financial support. To effectively relay information and conservation-related issues to people in remote areas, we trained and worked with radio broadcasters.

As the threats to the loss of habitat and biological diversity continue to prevail, a strong grassroots constituency may play a key role in reversing this trend and pave the way for reform. Thus, we are actively promoting serious enforcement of wildlife laws. We have already began developing our advocacy program and piloting this in one of the provinces of Mindanao island. The concept involves assembling all the stakeholders—communities, local government officials and military units—to recognize the problem and develop mechanisms to enforce conservation laws, including organizing crack military units to apprehend offenders.

3) Field research

Advocacy and all our other conservation actions are made more credible if these are well grounded on sound science. Thus, our team focuses on improving the level of biological investigation in the Philippines by ensuring the quality of fieldwork and piloting the use of modern technology in aid of conservation research. By applying the lessons obtained from research to our proactive programs, we hope to manage the species' population effectively and achieve recovery goals

Among the work currently being tackled by our field biologists is a radio-telemetry project undertaken since 1998 to test some hypotheses on home range size, habitat use, and mortality rates. Since then, seven eagles were radio-tagged: four post-fledging juveniles and three adults. Of the four juveniles, all suffered mortality in the technical sense. One died of unknown cause, one was killed by a farmer, while the last two birds were trapped, again by farmers. Of

these two birds, one was released while the other was kept for breeding at the Philippine Eagle Center. Being less wary of people than adults, juveniles appear more vulnerable to human persecution. High juvenile mortality could be disastrous for a critically endangered species as no new individuals are available to replace dying and old individuals.

Further telemetry work on three adult eagles revealed dispersal over wide, open landscapes. The territories of these birds were composed of isolated forest fragments, and nest sites may not necessarily be foraging areas. The eagles crossed intervening grasslands and agricultural lands to forage elsewhere. Thus, forest fragmentation seems to cause home ranges to expand and may result to greater home range overlap among adjacent pairs. Future telemetry and behavioral studies will focus on this and other impacts of forest fragmentation to behavior, survival and productivity.

It is not currently possible to derive accurate estimates of wild breeding eagles for the whole archipelago because of the absence of data in Luzon, Leyte, and Samar. The latest survey of Leyte Island was done two decades ago (Kennedy 1985), and some investigators suspect that eagles might be extirpated there. The latest survey of Samar was by PEF in 2002 and only two pairs were found at that time. From the extent of the remaining forest there, Luzon might also contain a large population. But a nest still remains to be verified in Luzon. In comparison, a total of 50 nesting attempts by 29 pairs have been documented in Mindanao Island (Miranda et al. 2000).

In 2004, the PEF embarked on a major expedition to survey eagle pairs and nests in the Northern Sierra Madre Natural Park (NSMNP) of Luzon. The eagle survey at NSMNP was done in collaboration with World Wildlife Fund–Philippines who helped provide financial support for the expedition. We found four Philippine Eagles during this expedition and trained local people, including the DENR and residents, on survey techniques in the hope that they will sustain research on and protection of the species. Unfortunately, WWF's own funding for the NSMNP Project was withdrawn by the Royal Netherlands Embassy which, in turn, resulted in the premature end of the eagle survey in the Sierra Madre. Given the importance of the study towards managing the species population, we are currently looking for funding to enable us to continue this initiative.

4) Community-based conservation initiative

Protecting the Philippine Eagle or any other

species in the wild has always been problematic. For example, the government allocates only a single guard for every 3,581 hectares of forest. Because of this situation, we have been focusing our attention at engaging the partnership of local communities in the uplands since 1991. We believe that upland communities represent the rationale choice for the defense of our forests. Marginalized through years of government neglect, local communities in the uplands often rely on the forest to survive.

Our work with local communities focuses on poverty alleviation through capability building and enterprise development with increasing efforts invested on network development. By linking local communities with other NGOs and government services, we have been able to increase resources available to the community. Additionally, this helped address a host of issues including land tenure, ancestral domain claims, health, and education.

Community-based conservation is currently going on in two key eagle habitats in Central Mindanao. We work with the *Higaonon* tribe in the Pulangi watershed in Bukidnon province. This engagement involves land use planning, documentation of cultural practices and genealogy, processing of their claim to the land, livelihood feasibility studies and testing, reforestation, and capacity building. We are now in the process of a gradual phase-out and will turn over responsibility over project management to the tribe's Council of Elders by 2006. The other project is with the *Manobos* of Arakan Valley in south-central Mindanao where the work is somewhat similar except that the goal is to build tree corridors to connect forest fragments across the provincial boundaries. Additionally, we are working with the provincial governor and the local police to help enforce forest conservation laws.

Because of the species' strong fidelity to nest sites, which in Mindanao were found mostly near forest edges where large and suitable nesting trees are confined, the focal point of past community-based conservation projects were critical breeding grounds. But in recent years, our project site selection process shifted from nest sites to entire mountain ranges focusing on strategically located communities. By doing this, we can secure resident pairs throughout its entire home range. It also gives an added benefit of preventing further intrusion into the forests as well as inhibit the smuggling of forest products from the mountains. As a tool for securing community support and to facilitate location and protection of breeding

birds and nest sites, we maintain our "adopt-a-nest" project. This is a modest reward scheme that provides financial incentives to individuals and their respective communities for reporting and monitoring occupied nests.

5) Future activities

One of the goals of conserving species is to preserve as much genetic diversity as possible. Because geological evidences indicate that Luzon may have been separated from the Greater Mindanao Islands by about ten million years, from the standpoint of population genetics, significant genetic differentiation might have occurred. The PEF, in collaboration with the University of Michigan, will be doing DNA studies of Philippine Eagles. Lerner's (2005, in press) work has already shown that Philippine Eagles are more closely related to African snake eagles than the subfamily Harpiinae. Aside from contributing to our knowledge on the evolution and phylogeny of the species, such information has important implications on management decisions involving eagle reintroductions and translocations.

In terms of *in situ* work, we are currently working on plans to expand an on-going habitat corridors project across Mindanao island. Toward this end, we have already began collaborating with two academic institutions in Mindanao and undertaking surveys to document key vertebrate indicators within the Eastern Mindanao Corridor (EMC). This project is a preparatory stage for a civil-society led establishment of a system of protected areas within the EMC. The EMC is a huge mountain range that extends from the northeastern tip to the southeastern end of Mindanao Island and is known to hold at least 11 eagle territories. An important component of the project is building local capacity of human communities, local government units, and other organizations to monitor ecosystem health through key vertebrate indicators and using flagship species as focal point of resource conservation. Being good indicators and flagships, we will encourage the use of raptors as an umbrella species to help local officials manage their resources effectively. But more than technical knowledge, investments need to be made to help address the needs of the local people. In the end, it is their involvement and commitment that will make the difference in the conservation of these natural areas.

Further *in situ* conservation work is envisioned as we plan on expanding current efforts in the Pulangi watershed and in the Arakan Valley conservation area. As most of these areas harbor indigenous cul-

tural communities, conservation initiatives need to be planned and implemented in the context of each area's ancestral domain management plans. Coupled with more studies in other potential eagle habitats across the country, these activities prepares the groundwork for future reintroductions.

Clearly progress has been made to help save the Great Philippine Eagle. These plans present a road map for the species' successful recovery. Yet, this daunting challenge cannot be accomplished by any organization alone. We believe that it only through concerted efforts of Filipinos and the international community that realistic results can be achieved. It is a challenge we hope both local and international government and civil society will take on with us.

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