

# Causes of Philippine Eagle (*Pithecophaga jefferyi*) Mortality at the Philippine Eagle Center, Davao City from 1970–2006

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## Abstract

We conducted a retrospective study to identify the causes of mortality of Philippine Eagles admitted from the wild and those hatched in captivity at the Philippine Eagle Center / Philippine Eagle Research and Nature Center in Davao City from 1970-2006. Of the 40 mortalities recorded during this period, 36 (90%) were wild-caught and 4 (10%) were hatched in captivity. The cause of death for majority of the wild-caught birds was unknown (44.4%), followed by infectious disease (25%), metabolic and nutritional disease (16.7%), trauma (11.1%) and neoplasia (2.8%). Causes of mortality for the four captive-bred eagles were identified as congenital anomaly, metabolic disease, pneumonia and electrocution.

Keywords: avian diseases, Philippine Eagle mortality

## Abbreviations:

CPR – Center for Philippine Raptors

IUCN – International Union for the Conservation of Nature

DENR – Department of Environment and Natural Resources

PEF – Philippine Eagle Foundation

PERNC – Philippine Eagle Research and Nature Center

## Introduction

Interest in causes of morbidities and mortalities of raptors has increased and reasons for such attention include decline in wild populations and concerns about death and diseases in captive birds of prey (Cooper and Greenwood, 1980). Mortality records in rehabilitation and captive breeding facilities provide a foundation for the development of sound management guidelines (Boal et al., 2005). In conservation, wildlife health and diseases are very important aspects that should be considered in any species survival plan.

The Philippine Eagle is listed as “critically endangered” in the International Union for the Conservation of Nature’s (IUCN) red data book. Currently, there is little published information on diseases and mortality of wild and captive-bred Philippine Eagles. Thus, there is a need to compile information gathered through the years and make these available to conservationists. The data can then be used to assess disease threats, identify research priorities, and develop improved screening and quarantine procedures for wild and captive birds.

The Philippine Eagle Center (PEC) in Malagos, Davao City currently holds the biggest collection of captive Philippine Eagles in the world with 35 eagles under its care as of December 2006. The care of these endangered birds has come a long way since the establishment of the Monkey-Eating Eagle Conservation Program in 1969. Captive eagles were initially kept at the Philippine Eagle Research and Nature Center (PERNC) under the Department of Environment and Natural Resources (DENR) in Baracatan, Toril, Davao City from the early 1970s to 1987. In 1988, the entire captive breeding facility moved to its present location in Malagos, Davao City, and later became known as the Philippine Eagle Center. The PEC became the focal point for the eagle’s captive breeding, rehabilitation and research especially in Mindanao and has thus accumulated a vast array of medical information on Philippine Eagles through the years. In this paper, we present the causes of mortalities of wild-caught and captive-born Philippine Eagles at the PERNC / PEC from 1970-2006.

## Materials and Methods

All existing records of Philippine Eagles at the PERNC / PEC in Malagos, Davao City, Philippines, from 1970 to December 2006 were examined for this study. These include medical records, admission/retrieval reports and mortality/necropsy reports. Most of the original records of the eagles admitted from 1970-1991 were either destroyed by rainwater, termites or were lost when the captive breeding facility moved from Baracatan, Toril to Malagos, Davao City in 1988. Secondary data transcribed from the original by PEC staff through the years however survived, and although not as detailed as the original, they still contain important information such as date of admission, origin, age, sex and the date and cause of death. These secondary data served as the main source of information for the eagles admitted from 1970-1991. Original records were examined for the eagles that were hatched in captivity and admitted from the wild from 1992 onwards.

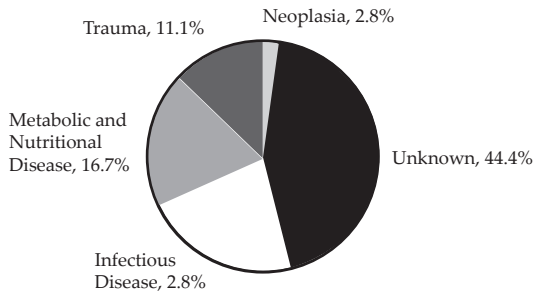
The causes of mortality were grouped into the following categories: trauma, infectious disease, metabolic and nutritional disease, neoplasia, congenital/developmental disease and unknown/undetermined. All cases with no definite cause of death or wherein no confirmatory tests were done to validate post-mortem findings were included in the unknown / undetermined category. A Chi-square test was used to compare difference in admissions and mortalities during the breeding and the non-breeding season.

## Results and Discussion

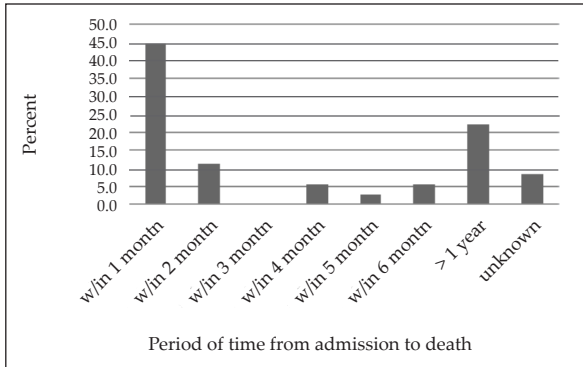
A total of 59 wild Philippine Eagle admissions and 21 chicks hatched in captivity were recorded from 1970 to 2006. Of the 59 wild-caught birds, there had been 36 mortalities, 5 releases and the rest are still alive and included in the PEC's captive breeding program. Four mortalities were recorded for Philippine Eagles that hatched in captivity.

### Wild-caught Philippine eagles

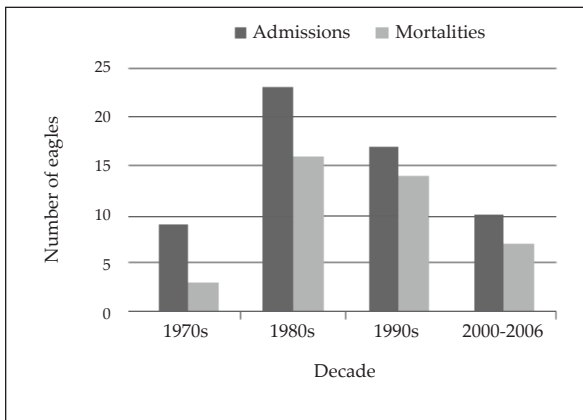
Thirty-six wild-caught Philippine Eagle mortalities were recorded at the PERNC / PEC from 1970 to 2006. The most frequent cause of death for wild-caught eagles was unknown or undetermined (44.4%), followed by infectious disease (25%), metabolic and nutritional disease (16.7%), trauma (11.1%) and neoplasia (2.8%). There was no mortality due to congenital / developmental disease (Figure 1).



**Figure 1.** Causes of mortality of wild-caught Philippine Eagles at the PEC from 1970-2006



**Figure 2.** Proportion of wild-caught Philippine Eagle deaths within a specific period after admission



**Figure 3.** Wild Philippine Eagle admissions and mortality by decade

**Table 1.** Causes of mortality of Philippine Eagles admitted to the PEC/PERNC by season, 1970 – 2006. Unknown row signifies admissions or mortalities wherein only the year of admission/death was recorded therefore impossible to qualify into any of the breeding seasons

Season admissions	Number of mortalities	Number of cause	Cause of Death (%)				
			Unknown	Infectious /Nutritional	Metabolic	Trauma	Neoplasia
Breeding Season	33	22	9 (40.9%)	6(27.3%)	2(9.1%)	4(18.2%)	1(4.5%)
Non-Breeding Season	23	13	6(46.2%)	3(23.0%)	4(30.8%)	0	0
Unknown	3	1	0	1	0	0	0
Total	59	36	15	10	6	4	1

**Table 2.** Causes of mortality of captive-born Philippine Eagles at the Philippine Eagle Center from 1992 to 2006

Name	Age	Sex	Cause of Death
Mindanao	1 day old	Not on record	Congenital anomaly
Kabayan	2 years	Male	Trauma (electrocution)
Chick # 15	4 days old	Not on record	Infectious(Pneumonia)
Chick # 17	2 months	Not on record	Metabolic and Nutritional disease

Unknown/ undetermined was the most frequent cause of death during the breeding and the non-breeding season (Table 1). Ten out of the 15 unknown or undetermined cases were suspected aspergillosis cases. Granulomas, tubercles or fungi-like growths in different organs were seen during necropsy but no culture or histopathology was done to confirm the cause of death. Ten wild-caught eagles died of infectious causes and aspergillosis (50%) was the major diagnosis in this category followed by reproductive tract infection (20%). Renal failure heads the list of metabolic and nutritional-related mortalities with 2 out of 6 cases recorded (33%). Emaciation was seen as the cause of death in only one case. All trauma-related mortalities were recorded during breeding season (Table 1). Two birds died from gunshot wounds, one from cage mate aggression and the other from being hit by a fallen branch. One case of neoplasia was seen when a 33-year old male eagle succumbed to squamous cell carcinoma in 2005.

Figure 2 shows that 44.4% of all wild-caught Philippine Eagle mortalities occur within a month following admission. Sixty-nine percent of all mortalities happen within a year after retrieval/admission. Admissions from the wild and mortalities occur more

frequently during the breeding season as compared to the non-breeding season (Table 1). The difference in mortalities between the breeding seasons, however, is not statistically significant ( $P>0.05$ ). The number of Philippine Eagle admissions from the wild peaked in the 1980's. This is also the decade wherein the highest number of mortalities were recorded (Figure 3).

### **Eagles hatched in captivity**

Only four mortalities were recorded for Philippine Eagles hatched in captivity. One of these is Kabayan, a juvenile eagle and the first captive-bred Philippine Eagle released to the wild. The eagle died of electrocution after landing on a power pole inside the Mt. Apo National Park. The causes of mortality for the rest of the eagles are pneumonia, congenital defect and metabolic and nutritional disease (Table 2).

Majority of the eagles in this study had unknown or undetermined causes of mortality. The bulk of these cases were seen during the 1980's when wild Philippine Eagle admission was highest and medical, retrieval and admission protocols were not yet well-established. From 1990 onwards, less undetermined mortalities were recorded as more information on raptor medicine became available and more veterinarians got involved with the care of the eagles.

It is interesting to note that 10 out of the 15 unknown or undetermined causes of death were listed as suspected aspergillosis cases. Because other diseases can cause tuberculous or granulomatous lesions, the cases were grouped under the unknown or undetermined category if no confirmatory tests were made. Thus, the incidence of mortalities due to aspergillosis in Philippine Eagles as reported here may be under-represented.

Aspergillosis, caused by the ubiquitous fungi *Aspergillus fumigatus*, is the biggest killer in the infectious disease category in our study. It is also the leading cause of morbidity and mortality of Philippine Eagles at the Center for Philippine Raptors (CPR) in Los Banos, Laguna (Celis, personal communication). Certain raptors including the golden eagle, gyrfalcon, osprey, goshawk and the rough-legged hawk are considered high risk for this infection (Joseph, 1998). Considering the number of confirmed and unconfirmed aspergillosis cases experienced by the PEC and the CPR staff, we believe that the Philippine Eagle should be included in the high risk category.

*Aspergillus sp.* is an opportunistic pathogen which typically thrives in hot, humid environments. The disease appears as a sequel to some other form of stress such as recent change in management, poor condition and concurrent disease/injury (Redig, 1993). We have

observed that most confirmed and unconfirmed aspergillosis cases at the PEC occurred when the eagles were under the greatest stress such as the first two months after admission or when they had been transferred to a new cage. It is PEC's protocol to prophylactically treat new admissions with antifungal drugs because of the apparent susceptibility of Philippine Eagles to aspergillosis.

One mortality due to emaciation was recorded and mortalities due to trauma comprised only 11.1% of all wild-caught eagle mortalities at the PEC and PERNC. Our findings are in contrast with studies on morbidity and mortality of raptors in the United States by Wendell et al. (2002) and Deem et al. (1998). In both studies, trauma was the leading cause of morbidity and mortality in admitted raptors and emaciation or poor nutrition contributed a sizeable degree to these mortalities. In both studies, trauma was the leading cause of morbidity and mortality in admitted raptors and emaciation or poor nutrition contributed a sizeable degree to these mortalities. In our experience, all wild-caught Philippine Eagles suffer from some sort of trauma upon admission (i.e. during capture, transport) but very few actually die of it except in cases of fatal gunshot wounds. Usually, the stress brought about by trauma predisposes the bird to an opportunistic disease like aspergillosis, and it is usually this secondary illness that eventually kills the bird.

Direct anthropogenic sources of mortality in our study were limited to the two gunshots and one electrocution incident in a released eagle in 2005. The first captive-bred Philippine Eagle released back to the wild died accidentally of electrocution nine months after it was released inside the Mt. Apo National Park. The Philippine Eagle Foundation has developed power pole aversion training for young eagles bound for release as a result of this incident.

We recorded a case of squamous cell carcinoma in an old eagle that had been in captivity for 33 years. It was the first time that a confirmed case of neoplasia was reported in a Philippine Eagle. Degenerative diseases and neoplasia are expected to be recognized more frequently as birds are kept longer in captivity.

No mortality cases due to toxicosis were seen. Tests for heavy metals, toxins and pesticides had not been carried out on any Philippine Eagle based on records. There had been one case of suspected lead poisoning in an eagle in 1979 but no tests were done to confirm the suspicion. Since then, there hasn't been a case of a Philippine Eagle that had enough presenting signs of toxicity to warrant toxicological tests. Raptors are at the top of the food chain and are generally known to bioaccumulate environmental

contaminants (Wendell et al., 2002). In the study by Deem et al. (1998), toxicity was the second most common disease category after trauma in raptors admitted to the University of Florida Veterinary Teaching Hospital from 1988-1994. In the U.S. and other countries, pesticides are a significant source of bird mortality (Pimentel et al., 1991). The apparent lack of Philippine Eagle deaths due to toxins could have two meanings. First, it is possible that raptors dying from toxicities die even before they have a chance to be retrieved or reported. Second, the feeding habits of the eagles may also play a role. Philippine Eagles are not known to be scavengers and are unlikely to consume prey that had been shot or poisoned. Based on unpublished studies of feeding habits of Philippine Eagles in the wild, the eagles still prefer to hunt live prey such as flying lemurs, civet cats and monkeys (Concepcion, personal communication). This however, may not be the case in areas wherein only marginal forest land remains. Eagles that live in these areas have been documented to hunt domestic chickens, dogs and cats for food. For these eagles, the risk of dying from consuming prey items that had been treated with organophosphates, carbamates or poisoned with rodenticides is high.

Our study confirmed that the first month after retrieval is the most crucial period for wild-caught Philippine eagles since most mortality occur in this period. Philippine Eagle admissions and mortality peaked in the 1980s. Massive information campaigns during this period resulted in increased public awareness. As a result, many private collectors turned over eagles in their custody to the DENR/PEF. Since the 1970s, there had been an average of 1.6 wild-caught Philippine Eagle retrievals per year. More admissions and mortalities were recorded during the breeding season (July to January) compared to the non-breeding season (February to June). Although the difference between the seasons is not significant, we theorize that more admissions and mortalities occur during the breeding season primarily because eagle activity and vocals are increased, thus, making the eagles more conspicuous to being hunted or trapped. This is also the period when chicks produced during the previous breeding season fledge and sub-adult eagles begin to leave their parent's home range to look for vacant territories. Some of these eagles may cross vast open spaces of agricultural land making them more susceptible to being seen and shot. It is also during the breeding season that reproductive-related disorders occur.

Examining mortality and morbidity records at rehabilitation and breeding centers will remain an important method for monitoring environmental health as well as provide current information on the

natural history and conservation of many species (Ress and Guyer, 2004; Wendell et. al., 2002). Knowing the specific causes of death of the eagles in our facility allowed us to lay guidelines and develop stricter protocols to prevent such cases from happening again. We hope that with improved hospital facilities, diagnostic equipment and staff training, less unknown diagnoses will be documented in the future.

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