Research note

CONSERVATION BREEDING OF NEGROS BLEEDING-HEART PIGEON *Gallicolumba keayi* (Clarke, 1900) (Aves: Columbidae)

Emilia A. Lastica[1], Apolinario B. Carino[2], Pavel Hospodarsky[2] and Lou Jean Cerial[3]

ABSTRACT

The Negros Bleeding-heart pigeon *Gallicolumba keayi* is found only in the islands of Panay and Negros, where, until recently, little information is known of its biology both in the wild and in captivity. In 2007, the first captive breeding of the species occurred at the AY Reyes Botanical and Zoological Garden, followed by other successful attempts at the Negros Forests and Ecological Foundation Biodiversity Conservation Centre. Double clutching and cross-fostering were two of the major methods used. This paper describes breeding behavior and established breeding, incubation and rearing intervals of the species.

Keywords: breeding, conservation, *Gallicolumba keayi*, Negros bleeding-heart pigeon

INTRODUCTION

In 1999, a single female Negros bleeding-heart pigeon was turned-over to the Negros Forests and Ecological Foundation, Inc. Biodiversity Conservation Center (NFEFI-BCC) in Bacolod City, Negros Occidental. The animal was approximately 18 years old and died shortly thereafter. Meanwhile, a pair of Luzon bleeding-heart pigeons (*G. luzonica*) were breeding actively in the same facility, thus most of what is known about the breeding behavior and biology of bleeding-heart pigeons were gleaned from this experience. In 2006, two female Negros bleeding-heart pigeons were brought to the Silliman University Center for Tropical Conservation Studies (SU-CenTrop) at the AY Reyes Zoological and Botanical Garden in Dumaguete City. These birds joined a male that was rescued from a hunter and brought to SU-CenTrop in 2004. Observations on breeding biology have not been described in Negros bleeding-heart pigeons (Collar *et al*., 1999; Kennedy *et al*., 2000; Tabaranza and Mallari, 1997) whether in the wild nor in captivity; thus, this study was conducted to elucidate on the breeding behavior of this bird.

[1]Department of Veterinary Clinical Sciences, College of Veterinary Medicine, University of the Philippines Los Baños, Laguna, Philippines (email: emlastica@gmail.com), [2]Philippine Biodiversity Conservation Foundation, Inc., Malate, Manila, [3]Silliman University Center for Tropical Conservation Studies, Dumaguete City.

MATERIALS AND METHODS

Negros and Luzon bleeding-heart pigeons

Two female Negros bleeding-heart pigeons were brought to the SU-CenTrop after the former owner of the pigeons was persuaded by concerned individuals to submit the animals to serve as founder specimens for the conservation captive breeding of the Negros bleeding heart pigeons. The two birds, named TINY (NBH206) and CRIS (NBH106), arrived on December 11, 2006, joining a male rescued from a hunter in 2003 (Figure 1).

Figure 1. A male Negros bleeding-heart pigeon.

Upon arrival, the birds were given thorough physical and clinical examinations to assess their health. Physical examination revealed injuries to both wings of both birds, possibly caused by inappropriate enclosure size; however, apart from this injury, both seem healthy. Wound treatment was initiated immediately and pyrantel embonate (Combantrin®, Pfizer, Inc.) was given as prophylaxis for enteric parasites. Feathers were plucked for DNA sexing, which revealed that both were males. However, later observations proved that both individuals were female. This fact was proven correct after NBH106 laid its first egg on February 22, 2007 then again on the 23rd of the same month. Although these eggs were not fertile, the event proved that this female was ready to breed.

Two pairs of captive-bred Luzon bleeding-heart pigeons *Gallicolumba luzonica* were brought from the NFEFI-BCC to SU-CenTrop to serve as possible foster parents for Negros bleeding-heart pigeon chicks. Luzon bleeding-heart pigeons have been breeding at the NFEFI-BCC since 1998; thus, these animals have been proven to be good model species for the conservation breeding of the closely related *G. keayi*.

Enclosure and enclosure management

All the birds were housed in enclosures that ranged from 3-4 m^3. The breeding pair was housed in an enclosure that measured 1 m deep, 2 m long and 2 m high. The walls and roof of the enclosure were made of 2.54 cm 14-G welded wire attached to L-frames that were welded to 4-in diameter steel pipes. The flooring was 3 ft deep, surrounded by a concrete wall that served as a base for the enclosure walls and a box for the substrate, which consisted of soil planted with grass and covered with dried leaves and twigs. *Ficus* sp. and broadleaf mahogany (*Swietenia macrophylla*) seedlings were planted inside the enclosure to provide shade and hiding places. Wood perches were attached to the enclosure wall or hung from the roof to provide a variety of resting and roosting places. A 7.5 cm-deep water bath was located under a faucet in the middle of the enclosure. The water bath also served as the animals' source of drinking water. A black nylon netting separation barrier that spanned the width of the breeding enclosure was initially installed to prevent non-specific aggression. This barrier was later removed after the birds were observed to have initiated courtship.

Nests were provided for the animals at various points in the enclosure where visual barriers are located. The heights of nest locations varied from 20 cm to 1 m. Nests were made from coconut fiber, dried twigs of mahogany, broom bristles and dried leaves that were secured to perches by wire. The ends of the wire were bent and enough padding was provided to prevent puncture or trauma to the birds and eggs. The enclosures were cleaned every day before morning feeding. Water was replaced every day, also before morning feeding. Leftover food was taken out every day before afternoon feeding. Substrate was replaced or replenished every month or when needed. Water sprays were provided to water the plants every other day, or everyday in the summer to also help relieve the birds when temperatures become too high. The breeding area was cordoned off to prevent disturbance and provide the breeding pair with a relatively quiet and private environment.

Diet

The birds were provided with a diet of minced banana, papaya and mango; berries in season – bignay (*Antidesma bunius*), muntingia (*Muntingia calabura*), ripe *Ficus* sp. and a seed mix of mung beans, safflower seeds, rice grains, peas, millet and soybeans. Calcium was provided in the form of crushed eggshells and cuttlefish bone, and a mealworm, cut in half, was given for protein. Orlux® (Orlux, Belgium) egg food for parakeets and Calsure® (Vydex Animal Health and Nutrition, UK) were given as supplements. The birds were fed twice a day, at 7 am and 3 pm. Water was provided *ad libitum*. Scatter feeding was also practiced to encourage the birds to utilize a larger portion of the enclosure and to provide environmental enrichment.

Observation of courtship, mating, nesting and breeding behavior

The birds were observed for signs of courtship behavior every day before each feeding. Mating, nesting, breeding and chick-rearing behavior were observed for eight hours everyday until the chicks fledged. Observations were recorded in a journal and included date and time of observation, weather conditions, behavior observed and signs of disturbance or stress.

Breeding intervention

Double clutching was used to increase the number of offspring, while cross-fostering with the closely-related *G. luzonica* was done to increase the chances of survival. Both methods used followed those employed for the Mauritius pink pigeons, *Columba mayeri* (Swinnerton *et al*., 2004). The Philippine Bleeding-heart Pigeons Conservation Program was initiated under the aegis of a Memorandum of Agreement between the Department of Environment and Natural Resources Protected Areas and Wildlife Bureau (DENR-PAWB) and Bristol, Clifton and West of England Zoological Society (BCWEZS) signed on June 1999. Conservation breeding of the species was sanctioned under this agreement.

RESULTS AND DISCUSSION

Courtship was observed three months after the male NBH199 was introduced into the right half of the enclosure occupied by one of the females NBH106. Courtship calls were heard from NBH199 in the morning of February 23, 2007. These calls sounded similar to those emitted by *G. luzonica* (Kennedy *et al*., 2000), but with a deeper, drawn-out "*haa-ooooot"* lasting about one second and repeated three to four times. The female answered in a much more quiet, almost imperceptible call similar to the male. NBH106 was observed to frequent areas near the separation barrier. The lower corner flaps of the temporary barrier were opened to facilitate physical contact. Mating was observed three times on this day.

Calls from the male were answered by the female before mating commenced. The male was observed to flap its wings three times whilst vertically hopping once. An area without substrate was created around the male as dried leaves and twigs were blown away from the male's flapping. After this display, the male began to call loudly several times until the female approached. The male was also observed to peck at the female's bill (Figure 2). Mating occurred at ground level

Figure 2. Male and female Negros bleeding-heart pigeons in their enclosure. The male is seen pecking the female's bill, one of the behaviors displayed during courtship.

and lasted around 2-3 sec. Cloacal kiss was observed while the male flapped its wings while on top of the female.

Two out of the five nests installed were inspected. The female initiated nest inspection and rested on one that was 1.5 m high. Nesting behavior was observed in both male and female. Each bird took nesting material in its beak and shook it several times. Twigs that break were discarded, whilst flexible fibers were retained and brought to the nest. The female occasionally stayed in the nest while the male brought in material and placed it on her back, where she took it and put it in place under her belly or on one side of the nest. This behavior was observed for three days after mating.

Two eggs were laid one day apart 5-6 days after the last copulation. Both male and female birds participated in the incubation of the eggs; the male was observed to incubate the eggs for more than 50% of the time. After 15 days of incubation, the first chick hatched; its sibling hatched a day later. Both parents participated in the rearing of the chicks, which fledged around 13-14 days after hatching (Figure 3). The parents were also observed to mate during this time. After fledging, the chicks were often observed being fed by the male, and the female was observed nesting. Both chicks were removed from the enclosure 20 days after fledging after the male showed signs of aggression towards them.

Some conclusions were drawn based on initial observations on the species' breeding and rearing behavior. Like the *G. luzonica*, a clutch is composed of two eggs, 5-6 days after the last copulation. Egg-laying interval was 24±7.0 hours and the incubation period was 15±1.0 days. Hatching to fledging was 13±1.0 days. It was possible to use *G. luzonica* as foster parents of *G. keayi* because both species have the same incubation period. This is critical because the production of crop milk is greatly influenced by incubation period (Schultz, 2003). The provision of crop milk is important particularly during the first six days of life because it contains

Figure 3. Newly-fledged Negros bleeding-heart squabs.

immunoglobulin, and cannot be replaced by other food sources (Schultz, 2003; Vogel *et al*., 1997). At least four clutches of *G. keayi* have been reared using *G. luzonica* foster parents. The technique has also been used in the conservation breeding of Mauritius pink pigeons (*Columba mayeri*) and other columbid species (Mallinson, 1995; Swinnerton *et al*, 2004).

It was also seen that breeding and rearing were influenced by weather conditions, disturbance, stress factors and nutrition, particularly the availability of animal protein and calcium. The female was observed eating the remains of the shell that fell from the nest after one of the chicks hatched, presumably to recycle the calcium for the next breeding period.

In the interim, further field studies are needed to determine population densities and extent of occurrence, as well as determine the existence of vacant habitats as possible areas for future reintroduction. Continued efforts to uphold and/ or improve existing conservation measures both in-*situ* and ex-*situ* are needed to ensure the future of wild populations and their habitats.

ACKNOWLEDGEMENT

The authors would like to acknowledge the DENR–PAWB, BCWEZS, SU-CenTrop, NFEFI-BCC, the provincial government of Negros Oriental, Fauna and Flora International-Philippines and the Philippine Biodiversity Conservation Foundation, Incorporated for their support in this study.

REFERENCES

Collar NJ, Mallari NAD and TabaranzaJr BR. 1999. *Threatened Birds of the Philippines*. Manila: Bookmark, Inc.

Kennedy RS, Gonzales PC, Dickinson EC, Miranda Jr HC and Fisher TH. 2000. *A Guide to the Birds of the Philippines*. Oxford: Oxford University Press.

Mallinson JJC. 1995. Conservation breeding programmes: an important ingredient for species survival. *Biodivers Conserv* 4 (6): 617 – 635.

Schultz DJ. 2003. Columbiformes. In: Fowler ME and Miller RE. *Zoo and Wild Animal Medicine*. Missouri: Elsevier.

Swinnerton KJ, Groombridge JJ, Jones, CG, Burn, WR and Mungroo Y. 2004. Inbreeding depression and founder diversity among captive and free-living populations of the endangered pink pigeon *Columba mayeri*. *Anim Conserv* 7 (4): 353 – 364.

TabaranzaJr BR and Mallari NAD. 1997. Birds. In: WCSP. *Philippine Red Data Book.* Manila: Bookmark, Inc.

Vogel C, Gerlach H and Löffler M. 1997. In: Ritchie BW, Harrison GJ and Harrison LR. *Avian Medicine: Principles and Application*. Florida: Wingers Publishing, Inc.