

# INTAKE STUDY ON THE LESSER GREEN BROADBILL (*CALYPTOMENA VIRIDIS*) AT DISNEY'S ANIMAL KINGDOM

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## Abstract

A nine-day intake study was carried out at Disney's Animal Kingdom's (DAK) Avian Research Center on an adult pair (1.1) of the frugivorous lesser green broadbills (LGB). The pellet/produce/invertebrate diet was fed twice daily. Two collections were carried out; one with food items presented separated, and a second with all ingredients combined as prepared by keepers. The birds displayed a definite preference for certain food items. The data collected revealed that the Mazuri<sup>®</sup> Parrot Breeder was the preferred food item in the diet, and that Mazuri<sup>®</sup> Small Bird Breeder was not consumed. The fruit mix was not readily consumed, and combining the fruit mix with the green mix did not influence the consumption of greens. Mealworms were not preferred items. It was found that food items in the diet were offered in unnecessarily large quantities. Two birds ate an average of 18.2g dry matter (DM) per day. Approximately 62.3% of the total DM offered was refused, representing a yearly waste of 10.9 kg of food or \$46.76 per year. Laboratory analysis of the consumed daily diet (DM basis) showed the following values: crude protein 21.8%; crude fiber 4.9%; crude fat 9.3%; ash 0.5%; acid detergent fiber 4.3%; neutral detergent fiber 1.0%; gross energy 4,420 kcal/kg; vitamin A 19,740 IU/kg; vitamin C 506 mg/kg; vitamin E 127 mg/kg; calcium 1.1%; phosphorus 0.9%; magnesium 0.1%; potassium 0.8%; sodium 0.1%; iron 132 ppm; zinc 69 ppm; copper 18 ppm and manganese 0.1 ppm. The good health records of the birds might be an indication that the diet offered to the LGB at DAK fulfills this species' maintenance requirements.

## Introduction

Scientific data on the diet consumption and composition of specific bird species are lacking. In the case of the Southeast Asian LGB, a highly specialized frugivore of the family *Eurylaimidae*, general observations of diet selection in the wild have been performed, but nutritional analyses of this diet, as well as nutritional information of captive populations, have been seldom carried out.<sup>1</sup> The objectives of this study were to: 1.) obtain information on the actual intake of food items offered under DAK conditions to reduce waste; and 2.) obtain nutrient composition of all ingredients offered and determine the nutritional value of the diet consumed.

## Methods

### Duration

An initial 12-day collection was carried out from 8/27/02 to 9/4/02 at DAK. (Five days of collection were affected by inclement weather and were eliminated from the study.) A second collection was carried out from 11/20/02 to 11/21/02 to supplement information found in the first collection.

## **Animals**

One pair (1.1) of LGB was used in the study. The male had recently matured and been sexed via plumage coloring. The female had never laid eggs.

## **Enclosure**

Birds were kept together in a metal screen enclosure measuring 20' x 30' x 8' located at DAK's Avian Research Center (ARC). The enclosure, which was exposed to all weather conditions, had sand flooring and growing vegetation. Feedings took place on an elevated platform. Other birds in the enclosure were removed for the duration of the study. However toads, lizards, and ants were observed inside the enclosure.

## **Diets, diet preparation and collection**

Diets were fed at 0700 and 1300 hours. The diet fed at DAK during the study period consisted of Mazuri<sup>®</sup> Parrot Breeder pellets (PB), Mazuri<sup>®</sup> Small Bird Breeder pellets (SBB), fruit mix, green mix and an invertebrate item. Pellets were soaked in water to soften. Fruit mix consisted of cubed apples (25%), papaya (25%) and honeydew (12.5%), shredded and cooked sweet potato (25%) and sliced red grapes (12.5%). Green mix was equal amounts of finely chopped kale and endive lettuce. Mealworms (*Tenebrio molitor*) were the primary invertebrates fed. All food items were weighed individually in the morning, and offered on separate sides of a dish as follows: PB, SBB, fruit/green mix and invertebrate. The AM diet was fed out immediately and the PM diet was stored unsealed in a refrigerator until the afternoon feeding. Each item refused was weighed separately (greens and fruit mix were separated) and dried at 95°C in a conventional forage oven (Fisher Scientific - Isotemp Model 650) for 24 hours. Samples of the diet offered and refused were sent to Cornell University's Nutritional and Environmental Analytical Services (NEAS) for nutrient analysis. Dummy diets were prepared to gather moisture loss data from which actual intake on as fed (AF) basis was derived. In the second collection, modifications were made to the methods used in the first collection to determine food intake of the diet as offered by keepers. These changes included: mixing all diet components prior to presentation of diet, and weighing all components together at collection time. The two collections were compared to assess diet intake as related to diet presentation.

## **Results and Discussion**

### **Dry Matter Data**

Dry matter was determined for each food item as it was used in this study. DM data were obtained daily for each of the refused diet items. The totals for seven days of collection are shown in Table 1.

### **Diet Intake and Waste**

A large amount of waste is evident from Table 1. Fruit mix was not ingested as assumed. It represented only 15.0% of the total DM intake, which was 18.6% of the DM amount offered (Table 1). Green mix and fruit mix were combined during this study in response to previous keeper experience that the birds do not consume greens alone. The green mix was only 1.6% of the total DM intake, which represented 2.8% of the DM amount offered (Table 1). The SBB was not consumed. The consumption of mealworms was minimal. The most important food item

consumed was the PB, which represented 83.3% of the total DM intake, or 58.4% of the DM amount offered. The selection of this pellet considerably altered the food item ratios in the diet. It was obvious from this information that the item quantities currently offered in the diet were larger than necessary. The two LGB ate an average of 18.2g DM per day (64.2g AF). This resulted in a DM waste of 62.3% during this study (67.2% in AF).

### **Cost of Diet**

The projected yearly price for this diet was \$62.39, and waste would total \$46.76 or 74.9% of the offered diet. However, when keepers prepared diets actual waste was probably greater because measurements were made by volume, not weight.

### **Intake of Mixed Diet**

In the first collection, food items were offered separated, except for the fruit/green mix. In the second collection food items were mixed as offered by keepers. In Table 2, AF data from the first and second collections were compared to see if diet preparation affected the total diet intake. When food items were separated, the average total AF intake was 64.2g (Table 2). When food items were combined, the average total AF intake was 55.6g. The 8.6g variation represented a 14% difference and suggested that combining food items did not stimulate diet intake. The aim of mixing food items was for the green and fruit mixes to adhere to the PB pellets and increase their consumption. However, when diet items were combined, the PB pellets lost its round shape. This prevented the birds from readily picking up the pellets and might have affected consumption of the item.

### **Nutrient Analysis of Diet**

The food items offered were analyzed for crude protein (CP), crude fiber (CF), crude fat (Cfat), ash, acid detergent fiber (ADF), neutral detergent fiber (NDF), gross energy (GE), vitamins and minerals (Appendix 1). The dietary analysis program Zootrition® was used to calculate the composition of the diet offered and consumed based on our laboratory results. Table 3 shows the amount of nutrients in the offered and consumed diet. Table 4 shows the amount of nutrients consumed daily by the pair of LGB.

The most important ingredient consumed was the PB because of its high DM content and intake. Items with high water content did not greatly contribute to the nutrients ingested from the total diet and should be reduced or eliminated, as a separate enrichment program already provides enrichment food items.

Body mass recorded for these birds in a 6-month span varied little, and was always within target range. The medical records of DAK LGB report no health issues and thus it appears the diet offered met the maintenance requirements for this species.

### **Conclusions**

The LGB displayed a definite preference for certain food items. The data collected revealed that the PB was the preferred food item in the diet, the SBB was not consumed, the fruit and green mix was not ingested as readily as believed and mealworms were not preferred, but were occasionally eaten. This study required that diet components be separated when presented to the birds. Practical feeding called for keepers to mix pellets and produce together, forcing the

animals to ingest both. The second collection in this study proved this method to be ineffective, as the mixing may have affected the physical appearance of the diet, particularly the PB, and did not allow the birds freedom in selecting from the items, and thus reduced intake.

It was found that food items in the LGB diet were offered in unnecessarily large quantities. Two birds ate an average of 18.2g DM (64.4g AF) per day. This produced a 62.3% DM (67.2% AF) waste of the diet offered in one week, a yearly waste of \$46.76 (10.9 kg of food per year). However, the waste during real feedings may be higher because keepers prepare diets by volume, not by weight. The good health records of these birds and consistent weights support that the diet offered fulfills the maintenance requirement for the species.

The challenge of gathering species-specific nutrient requirements has received increased attention in the last decade, but information of avian species is still greatly lacking. Even when the information is available, repeated experiments will be necessary to verify previous findings. Because waste is such a great concern with birds, it is necessary to carry out intake trials to cut the excess amounts offered to birds, yet maintain the feeding of appropriate nutrient in the diet. Animal keepers are integral to this effort and should be trained in carrying out controlled studies.

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#### LITERATURE CITED

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**Table 1.** Food items offered, refused and consumed by a pair of *Calypotomena viridis* during seven days of collection (DM Basis).

Item	Offered g	DM Offered %	Refused g	DM Refused %	Consumed g	DM Intake %
PB*	197.0	58.4	91.1	43.4	105.9	83.3
SBB*	67.2	19.9	67.3	32.1	-0.1	-0.1
Green Mix**	9.3	2.8	7.3	3.5	2.0	1.6
Fruit Mix***	62.7	18.6	43.5	20.7	19.1	15.0
Mealworms	1.0	0.3	0.7	0.3	0.3	0.2

Note: All food items were offered separated, except green and fruit mixes, which were combined  
 \* Pellets: Mazuri<sup>®</sup> Parrot Breeder (PB), and Mazuri<sup>®</sup> Small Bird Breeder (SBB). Water added to soften

\*\* Green Mix: 50% kale, 50% endive

\*\*\* Fruit Mix: cubed apples (25%), papaya (25%), honeydew (12.5%), shredded and cooked sweet potato (25%), sliced red grapes (12.25%)

**Table 2.** Total grams of diet consumed daily by *Calyptomena viridis* based on weights of individual food items (AF Basis, adjusted for moisture loss).

Diet	AM	PM	Total*
First Collection**	27.0	37.2	64.2
Second Collection***	15.4	40.3	55.6

\* Average of seven days in the first collection and of two days in the second collection.

\*\* Food items separated, except for fruit/green mix.

\*\*\* Food items offered combined.

**Table 3.** Nutritional analysis of diet offered and consumed by *Calyptomena viridis* (DM Basis).

	CP %	CF %	Cfat %	Ash %	ADF %	NDF %	GE kcal/kg	Vit A IU A/kg	Vit C mg/kg	Vit E mg/kg
Offered	21.3	n/a	5.7	6.0	6.9	11.3	4733.9	15,110	361	110
Consumed	21.8	4.9	9.3	0.5	4.3	1.0	4420.0	9,740	506	127

  

	Ca %	P %	Mg %	K %	Na %	Fe ppm	Zn ppm	Cu ppm	Mn ppm
Offered	1.2	0.9	0.2	0.7	0.2	133	83	14	97
Consumed	1.1	0.9	0.1	0.8	0.1	132	69	17	0.1

**Table 4.** Nutrients consumed daily by a pair of *Calyptomena viridis* based on an average intake of 18.2g (grams in DM Basis).

g	CP 4.0	CF 1.8	Cfat 1.7	Ash 0.1	ADF 0.8	NDF 0.2			
mg	Ca 203.8	P 156.5	Mg 25.5	K 142.0	Na 25.5	Fe 240.2	Zn 125.6	Cu 30.9	Mn 0.2

**Appendix 1:** Methods used in diet nutrient analysis

Test	Method
CP	AOAC 990.03 (Dumas or Combustion Method)
Ash	AOAC 942.05
Cfat	AOAC 920.39B
CF, ADF, NDF	Method for determining CF, ADF and NDF (closed vessel, filter bag method), ANKOM Technology, Macedon, NY
Lignin	Filter Bag Lignin Assay, ANKOM Technology, Macedon, NY
Minerals	AOAC 985.01 (ICP Method)
Gross Energy	ASTM D240-64
Dry Matter	24 hours at 95° C in a conventional laboratory oven.

Note: All methods analyses carried out at NEAS of Cornell University, except DM (ANC Laboratory)