

Diet Charts: The Keeper's Tool and Aide

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For most institutions, whether public or private, conservation of endangered species is a high priority. Conservationist will use a variety of tools available to aid them in meeting their goals. Healthy reproductive animals are vital to the management of a viable captive population. One important tool, integral to successful survivorship of animals in our care, is dietary monitoring. One of the tools in use at the Baltimore Zoo is diet charts. The animal managers have found these charts to be an invaluable aid in keeping track of the general condition of the collection. The method of maintaining the charts is quite simple and part of the keepers' daily routine. The charts provide information about the animals' diet, group interaction, and other basic information critical to animal caretakers. Food items are weighed before and after feedings, then recorded on the diet charts daily by the keepers. This information is compiled monthly and reviewed by the animal managers, which may influence dietary or managerial decisions for the following month. Diet charts allow for consistency among the keepers in diet preparation and a place to record leftover amounts. Keepers might also notice trends in diet consumption that may be brought to the attention of the curators. As people concerned about wildlife conservation, we strive to provide the captive population with the best management facilities and diets our resources allow. By having a simple means to monitor dietary consumption, diet charts provide documented data to aid in a keeper's daily routine. With healthier collections, longevity is increased, as well as chances for reproductive success.

Key words: evaluation, nutrition, routine, weighing

INTRODUCTION

In the hope that captive animals will lead healthy and reproductive lives, zoos have concentrated on a mission of conservation. Management tools and techniques have been developed which have proven beneficial to the captive populations of many animals. The development of a tool to monitor feed intake has also shown benefits. The monitoring feed intake is not a new issue. Mary E. Allen, zoological nutritionist at the National Zoo, has dealt with this subject in 1980. Her paper, Monitoring Feed Intake, explains some of the benefits of dietary monitoring. Allen writes, "...there are many opportunities that all of us can seize to allow for the growth and expansion of knowledge in this field. The most basic and simple tool that we can employ to assess the general status of the animal is the measurement of feed intake." (Allen, 1980). She explained how dietary monitoring has given some insight into the health of the animal and aided in the correcting of dietary problems.

In 1995 we wanted to examine how far zoos, in North America, have come in using this dietary tool. A phone survey of forty zoos was undertaken to see how zoos' monitor their collections' feed intake. Those who responded to the survey came from a variety of positions within the zoological field. The survey targeted three groups; small, medium, and large sized zoos;

separated by the number of full time employees, as listed in the 1994-1995 AZA directory (Table 1).

TABLE 1. Survey group separation (size of zoos surveyed based on full-time employees number).

Zoo Size	Sample (n)	Number of Employees
small	10	<30
medium	10	30-100
large	20	>100

The distribution among the groups in the survey has been represented by the corresponding tables (Tables 2-5). Some interesting things have been found to show how the issue of dietary monitoring has established itself.

Table 2 represents the distribution of people involved in the determination of diets at the zoos surveyed. Of the zoos surveyed forty seven and a half percent either currently employed a nutritionist (22.5%) or seek nutritional advise (25%) (this advise came primarily from nutritional consultants or others zoos) to determine their diets.

TABLE 2. Diet developers at Zoo surveyed

Diet developer	Small Zoos (%)	Medium Zoos (%)	Large Zoos (%)	Total All Zoos (%)
Nutritionist	0	10	40	22.5
Consult	30	30	20	25.0
Veterinarian	10	10	15	12.5
Curator	10	0	10	10.0
Staff Cooperation	30	40	15	22.5
Other	20	10	0	7.5

When asked if the zoo implemented some form of dietary monitoring approximately thirty-two percent said "NO" (Table 3).

TABLE 3. Frequency of implementation of dietary monitoring

<u>Frequency</u>	<u>Small Zoos (%)</u>	<u>Medium Zoos (%)</u>	<u>Large Zoos (%)</u>	<u>Total All Zoos (%)</u>
No	50	40	20	32.5
Occasionally	20	0	5	7.
<u>Daily intake:</u>				
With "some" of collection:	10	10	30	20.0
With "most" of collection:	20	20	30	25.0
Weigh in/out intake of "most" of collection:	0	30	15	15.0

Even more interesting; of the zoos surveyed only fifteen percent said that they weighed their diets in and leftovers out on a daily basis for "Most" of their collection.

The issue of keeping daily dietary records is strengthened when ninety-five percent said that they could see benefits for keeping such records (Table 4).

TABLE 4. Response to daily weighing of dietary consumption

<u>Response</u>	<u>Small Zoos (%)</u>	<u>Medium Zoos (%)</u>	<u>Large Zoos (%)</u>	<u>Total All Zoos (%)</u>
Do see benefits.	90	50	80	75
Do see benefits but question how practical it is.	10	40	15	20
Can see no benefits	0	10	5	5

In response to how they would utilize dietary records, eighty-five percent of the zoos responded, to monitor health of the animal and/or evaluate the animal's diet (Table 5).

TABLE 5. Response to applicable uses of dietary monitoring

<u>Response</u>	<u>Small Zoos (%)</u>	<u>Medium Zoos (%)</u>	<u>Large Zoos (%)</u>	<u>Total All Zoos (%)</u>
Health	50	40	25	35.0
Diet Evaluation	20	30	40	32.5
Health/Diet Eval.	10	30	15	17.5
Other	20	0	20	15.0

The basic level of any record keeping system has to be its recorders. In the zoo setting, this role falls traditionally to the animal keepers. Francis Woods, as a Senior Animal Keeper at the Los Angeles Zoo, wrote, "It is the keeper who will note how the diet is being accepted, if the amounts offered are adequate,.... His observations will be important in deciding if the adjustments are successful or not." (Woods, 1987) Her paper, The Role of a Keeper in a Diet Evaluation Program, addresses the keepers' importance during a diet evaluation study at the Los Angeles Zoo. For a feed intake monitoring tool to be successful, it must be developed with the keeper in mind.

There is a variety of dietary monitoring tools used at animal care facilities. Many of these facilities have implemented the use of diet cards, sheets, or charts each one slightly different than the other. The Baltimore Zoo has used diet charts to monitor diets offered and consumed for more than fifteen years. These diet charts have been designed to be easily used in the keeper's daily routine.

METHODS

Construction of the Diet Chart

The diet chart used at the Baltimore Zoo is a computer generated calendar grid on which information about the specimens' diets has been provided. The chart (Appendix 1) provides such information as animal identification, specific weights of each dietary item, and dietary offering. There is an area provided (Appendix 1-A) on the chart where keepers write their initials to show who prepared the diet; who worked the area and that the animal received its daily diet.

Using the Diet Chart in Diet Preparation

Since keepers work in more than one area, the diet chart contains all the dietary information the keeper needs to make up the animals' diets in their area for that day. It is critical that keepers weigh the diets, therefore reducing variability among keepers.

Scales have been provided for all animal areas to allow for accurate measurements. Measurement by volume has potential for greater variance among keepers and is not as accurate, in general, when recording leftovers.

Notes (Appendix 1-B), on the diet charts, provide information to the keeper about the manner of diet presentation that the animal is to be given during that period. They also left the keeper know what information the managers may also want to know.

The diet chart is used to remind the keeper about enrichment days (on diet charts, enrichment is noted as, food items that are not part of the daily diet). On the diet chart an assigned enrichment group is noted for that day. From this group the keeper refers to the enrichment items list for that group. The keeper then chooses which enrichment item to give. Because the enrichment items have varied, a place (Appendix 1-C) to note which item was given has been provided to prevent repetition.

Recording leftovers

There are two methods that leftover amounts are recorded on the diet chart at the Baltimore Zoo. The preferred method is to actually weigh back each item in the diet that was offered. The leftovers are collected before cleaning is to take place. This method works best with food items such as biscuits, chows, grains and produce, because they are much easier to pick up and weigh out.

The second method of recording leftovers, but not as accurate, has been to estimate the leftovers. This option becomes more practical when dealing with the forages, i.e. hay. In most cases, the hay has been known to become wet or spread about, thus less practical to weigh. With the hay leftovers gathered, a weight estimate or percentage of the diet offered is made by the keeper and recorded on the diet chart.

The issue of feed consumption by pest and moistened diet evaporation must also be addressed when measuring leftover. Keepers will be more concerned with noticeable changes in food leftovers. For that reason, assuming the evaporation factor to be on average constant, recording leftovers of moistened diets does not need to include evaporation. As for the pest issue, diet charts help keep track of a possible pest problem. A sudden decrease in leftover amounts could indicate a possible problem with pest consumption. An increase in pest control shows its effectiveness, as leftover amounts return to normal and are noted on the diet chart.

Other Consideration with Diet Charts

Occasionally routine medical procedures become necessary for animals in a keeper's care. For this reason, the grid has provided enough room to inform the keeper 1) which animal the procedure is on, 2) when the procedure is, and 3) what routine changes may need to occur for the procedure. This information is written down by the supervisor to help the keeper prepare the animal for the ensuing medical procedure.

RESULTS

At the end of the month the diet charts are collected and the data evaluated. The dietary documentation over the month and even over the years has allowed some trends and generalizations in intake to be noted by staff. The dietary data collected by the keepers is then turned over to the curator and nutritionist. Keepers point out any observations that might explain any irregularities or trends noticed in the charts. The chart provides enough space for the keeper to explain these inconsistencies in the charts.

With the data gathered the staff can then calculate monthly average intakes and objectively evaluate the diet consumed. The diet consumed is often very different from the diet offered, particularly if multiple food items are provided. The diet information documented provides good historical data for an animal over the season and years.

Diet charts are always subject to review. At the Baltimore Zoo the collection is examined visually, at least once a month, by the managerial staff. This is done toward the end of the month, prior to looking at all the diet charts for the collection. Animal body condition, diet leftovers

(noted on the diet charts), and keeper input are all taken into account when changes are made on the diet charts for the next month. These changes are made in the computer program and new charts are generated for the next month. Of course if leftover amounts are too high or too low, prior to the review process, changes in the diet are made accordingly. These changes are noted on the chart with the date of change and the initials of the person making the change.

DISCUSSION

Keeping the diet chart to basic relevant information is key to a good diet chart. The ideal diet chart allows the keeper to easily incorporate it into their routine. Time that is spent on this aspect of the keepers routine is minimal, but necessary to obtain dietary information.

Many keepers may wonder how diet charts are important to them. This question is better directed to the importance dietary monitoring is to the animals in their care. Diet charts ensure a consistent diet as prescribed by the curator/nutritionist. It also gives the keeper a quick view of the animals' dietary trends and leftovers for the month. These trends may give possible warning signs to possible health, behavioral or diet acceptance troubles which need to be reported.

The data which is collected provides animal managers and nutritionists information needed to offer better diets. The overall health of the collection will, hopefully, benefit from improved dietary and management programs.

CONCLUSION

When selecting a proper dietary monitoring tool to use with your staff, one must keep in mind the following: "Keepers provide the basic information that make the assessment of diets possible. " (Woods, 1987). For this reason, diet charts need to be used in the keeper's daily routine without involving a lot of time, simplicity is the key.

Diets need to be evaluated, on a regular basis. This evaluation needs to consider the information the keeper has provided "If the keepers know that their input is added to the factoring of the diet analysis and dietary recommendations they are much more willing to work towards implementing changes should they occur " (Woods, 1987). Dietary evaluation allows caregivers to meet the constant dietary changes which occur to animals throughout their lifetime.

It is important that food items be weighed in and out -on a daily basis. The most important reason for weighing food items is that it provides for consistency in diet preparation. Diet evaluation and changes can then be more easily and accurately adjusted.

"Zoos are beginning (fifteen years ago) to recognize the need to address the problems of adequate nutritional management in their collections. Gradually data are being collected which relate to feed consumption and calculated composition of the diets fed... It is and will be a painstakingly slow process to begin to establish guidelines for the myriad of captive wild animals in our care but it is an area that has long been in need of our attention." (Allen, 1980).

REFERENCES

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Sunset Zoological Park, Manhattan, KS
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APPENDIX #1

Animal ID: 1.1 Diana (HBCDIANA) (CAGE #8) DAILY FEEDING CHART Month of February 1995
 1.0 Dennis (76-263) Sun. - Group B food items
 0.1 Sapphire (82-174) Fri. - Browse (weigh in/t out) **B**

Diet Offered: 9 oz 10 pro monkey chow 2.25
 2 oz Greens
 4 oz banana, apple
 4 oz yams, oranges
 1/4 vitamin each
 Mon.+Thurs. weigh in 6 oz alfalfa.

**Pls record what and when group A items are used. Leftovers are recorded on the same day as offered.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
5 B= 1/2 oz MC BB= rasin bran dd BB 12	6 A 1/2 oz MC BB 13	7 1.5 oz kale 1.0 oz MC BB (w) 14	8 1) leftovers not available collected approx. 25 kale c- pasta BB dd BH 8	9 1.5 oz MC 1.25 oz Yam 1.25 oz kale dd BB 15	10 Browse-N/A oz/ BB ¹ dd MS 10	11 2.75 oz MC dd BB 11
19 B= 5F seeds dd BB 19	13 1/2 oz MC BB 13	14 1.2 oz kale 1.0 oz Yam 2.0 oz carrot c- trizets/poys dd BB 22	15 c- rice BB dd BB 15	16 1.5 oz Yam dd BB 16	17 Browse-N/A oz/ MS ¹ dd BB 17	18 1.5 oz Yam dd BB 18
24 B= bird seed dd BB 24	17 1/2 oz Yam 1/2 oz Kale dd BH 27	18 c- popcorn DW dd BB 28	19 c- papaya DW dd BB 29	20 dd BB 23	21 Browse-N/A oz/ BB ¹ dd BB 24	22 dd BB 25
26 B= 5oz MC dd BB 26	18 dd DW 10 dd KH 28	19 BB 28	20 dd DW 29	21 Browse-N/A oz/ BB ¹ dd BB 24	22 dd BB 25	23 dd BB 26
27 B=	19 dd DW 10 dd KH 28	20 BB 28	21 c- 29	22 Browse- oz/ t 29	23 dd BB 26	24 dd BB 27

