

ENRICHMENT COMPARISON OF AFRICAN PAINTED DOGS (*LYCAON PICTUS*) HOUSED IN U.S. AZA-  
ACCREDITED INSTITUTIONS

A Professional Paper

by

TAMMY L. CLOUTIER

Submitted to the Department of Wildlife and Fisheries of Texas A&M University

in partial fulfillment of the requirements for a degree of

MASTERS OF WILDLIFE SCIENCE

December 2013

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Approved by:

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Chair of Committee, Jane Packard, Ph.D.

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Committee Member, Frances Gelwick, Ph.D

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Committee Member, Kim Dooley, Ph.D.

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Head of Department, Michael Masser, Ph.D.

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## Abstract

Enrichment encourages the diversity of naturally occurring behaviors, increases activity, and reduces stereotypic behavior. By considering the life-history and behavior of each carnivore species, more effective enrichment options may be provided. African Wild Dogs (*Lycaon pictus*, also known as Painted Dogs) are social carnivores that have complex pack dynamics (this includes degree of relatedness, pack size, etc.) and large home ranges. As there are relatively few studies on Painted Dog enrichment, the goal of this study was to compile a list of enrichment options used by institutions participating in the African Painted Dog Species Survival Plan (SSP). Data were provided by representatives at 23 (61%) institutions, who were asked to identify and describe social groups and enclosures, the frequency that enrichment was offered for each of six enrichment categories, the perceived success of each enrichment category, and overall best practices for enrichment. The majority of single-sex (n=17) and mixed-sex groups (n=28) were housed in enclosures with both naturalistic and concrete features. Respondents reported options for all six enrichment categories: environmental enrichment devices (n=22), habitat (n=11), sensory (n=28), food (n=26), behavioral (n=10), and social (n=2). All reported delivering enrichment at least multiple times a month, and most reported multiple times per week. Food and behavioral enrichment were perceived as most successful. I discuss respondents' suggestions for best practices for each type of enrichment category. Overall, respondents recommended a flexible approach, since not all individuals and groups respond in the same way to the enrichment options available for Painted Dogs.

## Introduction

Enrichment is a key component in the care of captive animal populations, and while it has advanced throughout the years, there is still room for improvement (Hoy et al 2010; Morgan & Tromborg 2007). The Association of Zoos and Aquariums (AZA) accreditation standards require the incorporation of enrichment, and Mellen and MacPhee (2001) suggest that enrichment programs be based on each species natural history. Utilizing what is known about behaviors and activity budgets in the wild can assist with implementing enrichment that will encourage species-specific behavior (Mellen & MacPhee 2001). As enrichment can vary in form and function, this could include environmental (i.e. items that provide interaction or alter habitat) or social (i.e. group composition) forms (Watters et al. 2011; Szokalski et al. 2012; Mellen & MacPhee 2001).

Primates and carnivores typically receive the most enrichment (Hoy et al, 2010; Clubb & Mason 2007), and studies of large carnivore enrichment have shown that similar choices are given to felids, ursids, and canids (Skibieli et al. 2007; Canino & Powell 2010; Coelho et al 2012). Examples include carcasses/hides (MacPhee 2002; AZA Large Canid Animal Care Manual (ACM) 2012), various scents (i.e. conspecifics, prey, spices) placed throughout the enclosure (Coelho et al. 2012; AZA Large Canid ACM 2012), and rearranging structures within the habitat (Kistler et al. 2010). As carnivores encompass a large array of species, it is difficult to assess whether enrichment meets the needs of each particular species, or even each individual (Dallaire et al. 2012). Time constraints and various responsibilities limit the amount of time that keepers and other staff have to evaluate enrichment items (Quirke & O’Riordan 2012).

Benchmarks for the effectiveness, or “success”, of enrichment include an increase in naturally-occurring behaviors (immediate and post-enrichment), a decrease in stereotypies (i.e. excessive pacing or licking and hair plucking), and/or an increase in the diversity of responses seen from a baseline of behaviors that are typically observed for the individual animals (Shyne 2006; Shyne & Block 2010; Morris

et al. 2011; Quirke & O’Riordan 2011; Coelho et al. 2012). One type of enrichment may alter the behavior of an individual or pack for one hour, whereas another form for that same individual or pack may create greater behavioral diversity over a period of one to two days (Bashaw et al. 2003; Coelho et al. 2012). Conversely, what may increase the activity of a species in one institution may provide no behavioral alteration for that same species at another institution due to variations among facilities (i.e. climate, keepers, item availability) (McPhee 2002; Claxton 2011). Public opinion may also alter or eliminate some options. Overall, visitors were agreeable to some opportunities for live prey on and off-exhibit, however allowing carnivores such as tigers (*Panthera tigris spp*) and cheetahs (*Acinonyx jubatus*) to have live rabbits on-exhibit was not an acceptable choice for some (Cottle et al. 2010; Ings et al. 1997).

Large carnivores like canids and felids may be prone to a wide range and higher level of stereotypic behaviors that are generally thought to indicate decreased welfare for the animals (Clubb & Mason 2007; Shyne 2006). Many of these species have large home ranges in the wild which may contribute to various atypical behaviors in captivity (Swaigood & Sheperdson 2005). Predictable feeding routines appear to contribute to pacing in coyotes (*Canis latrans*), ocelots (*Leopardus pardalis*), and leopards (*Panthera pardus*) (Gilbert-Norton et al. 2009). However, what may be categorized as excessive pacing in one individual, may not in another as definitions of stereotypic behavior and caretaker perceptions may vary (Swaigood & Shepherdson 2005; Shyne 2006). With the presentation of live fish and bones, tigers (*Panthera tigris sumatrae*) and lions (*Panthera leo*) increased hunting and other behaviors (Bashaw et al. 2003). Maned wolves (*Chrysocyon brachyurus*) displayed foraging behaviors when food was scattered throughout their enclosures even though food was also offered on trays and would have been easier to obtain (called contrafreeloading) (Vasconcellos et al. 2009). These examples provide evidence that more species-specific information is needed as there are relatively few



studies of wild canid enrichment in general (Vasconcellos et al. 2009), and only one that related to husbandry training for captive African wild dogs (*Lycaon pictus*) in particular (Shyne & Block 2010).

African wild dog packs (hereafter referred to as painted dog) have variable sized home ranges that may range from 23 mi<sup>2</sup> to 665 mi<sup>2</sup> (Woodroffe 2011), can travel up to 10 miles in a day (Jackson et al. 2012) and disperse over 50 miles (Davies-Mostert et al. 2012). Pack members generally hunt at dawn and dusk, and although prey types vary depending upon availability, examples include impala (*Aepyceros melampus*) and wildebeest (*Connochaetes taurinus*), warthogs (*Phacochoerus aethiopicus*), and African hares (*Lepus microtis*) (McNutt 1996; Creel & Creel 1995). As obligate cooperative breeders, they can live in packs of up to 20 adults, along with yearlings and pups (Courchamp et al 2002; Creel & Creel 1995). Pack size appears to play a role in reproductive and feeding success in the wild (Courchamp & Macdonald 2001; Carbone et al. 2005; Courchamp et al. 2002) and may be an important factor to consider in captive populations if breeding is a goal (Price & Stoinski 2006).

The purpose of this study was to aid institutions in deciding how they want to structure their African painted dog enrichment programs, by compiling enrichment data from across institutions participating in the Species Survival Plan (SSP). Objectives were to clarify: (1) examples of options from each enrichment category; (2) the frequency that items from each enrichment category were offered; (3) the keepers' perceptions of the relative success of various types of enrichment; and (4) recommendations for best practices.

## **Materials and methods**

Data were compiled through the African Painted Dog SSP network, which endorsed the project. AZA-accreditation standards define six enrichment categories that provided the focus for this study (Table 1). Hoy et al. (2010) provided similar enrichment definitions, but they were categorized in a slightly different manner. For example, Tactile, Auditory, Olfactory, and Visual enrichment are listed

separately. In the interest of simplicity, the Sensory category in our study incorporates the previous four categories into one. Hoy et al. (2010) also listed a Human-animal interaction category, which coincides with the behavioral enrichment of this study.

### *Questionnaires*

Representatives at each institution were invited by the SSP coordinator to complete a questionnaire (choice of online or paper format) (Appendix A). The questions addressed the following topics: identify and describe social groups and enclosures, the frequency (ranging from never to multiple times a week) that enrichment was offered for each of the six enrichment categories, the perceived success (ranging from not successful to highly successful) of each enrichment category, and caretakers' suggested overall best practices for enrichment.

Responses were received from 23 institutions (61%), with additional notification that 3 of the original facilities that were contacted no longer had painted dogs. Participants listed the number of painted dog groups (past and present) at their institutions and the group (or social) composition of each, which consisted of the number of adult males and adult females and if there were any pups or sub-adults. Each painted dog group listed by each respondent was counted as a separate social group. Results were tallied (Table 2). While group composition was included in this study, it was for informational and comparison purposes to determine if mixed and single-sex groups were provided with similar or different enclosure types, not included in the analysis.

Table 1. Definitions and examples of enrichment categories

Enrichment Category	Definition (Based on AZA-accreditation Standards)	Examples
Environmental Enrichment Devices (EED)	Novel or pre-existing objects that can be manipulated by an animal	Boomer balls (some with large holes for food, some solid and scented), hanging toys, boxes, plastic barrels, sticks, paper bags, jolly apples, bobbins, browse (acacia), hay, paper mache (balls, animals, houses, baskets), solid plastic football, unbreakable mirrors through a barrier, solid plastic doughnut, burlap bags, lids from 5 gal buckets, 5 gal buckets without handles, Kongs and tires, zipline and tug toy provided interaction for individuals and pack, used browse branches from prey animals
Habitat	Substrates, levels and other habitat complexities	Stacked logs, rotate exhibit, sand for digging, leaf piles, switch exhibits with other carnivores, pond, hay beds, fire hose hammocks/bed, elevated table, dogs will hunt through grass after mowing (bone pieces, rodents), tunnels
Sensory	Olfactory, tactile, auditory, visual or gustatory	Bottled scents/hunting lures, extracts, fish carcass, various fecal samples (elephant, rhino, etc.), deer/horse hides, herbs/spices, used hay from prey species, blood trails, mulch, grass clippings, mirror, TV, music, hoof trimmings, pumpkins, melons, snow, meatball hunt, untreated Christmas trees, striped hyena scent

paste, live goldfish and crayfish, BBQ sauce, honey mustard, non-dairy salad dressing, anchovy paste, yogurt, orange slices and other citrus smells, scents sprayed on trees and logs

Food	Food that is presented in a variety of ways to elicit hunting, feeding, foraging, or problem-solving strategies	Scattered around exhibit (buried, in trees, hidden in paper mache figures or Kongs, hanging feeder devices), bones, dry dog treats, carcasses, canned cat food, rats, rabbits, horse meat meatballs, blood icicles, peanut butter, horsetail, hard-boiled egg, mackerel, pig ears, celery with leaves, dried herbs, rabbit heads, chicks, beef heart, liver and tongue, chunk meat, trout, capelin, chicken, sirloin
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Behavioral	Training sessions to learn new behaviors and/or maintain established behaviors	Trained both separately and as groups, trained in different areas (on and off exhibit) including demos for public, examples: sit, down, shift, paw, open mouth, headshake, crush, station weight board, target, hold
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Social	Individuals are separated or grouped for feeding, husbandry, or play opportunities	Individuals are fed both separately and as a group (depending on pack dynamics), pups and sub-adults provide best enrichment!
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Table 2. Number of groups reported in each category of social composition.

Group Size and Composition	Number of Adult Males					
	0	1	2	3	4	5
0 Adult Females	^	1	1	6	2	1
1 Adult Female	0	15*	6*^	2	0	0
2 Adult Females	2	3	1*	0	0	0
3 Adult Females	0	1	0	0	0	0
4 Adult Females	1	0	0	0	0	0
5 Adult Females	1	0	0	0	0	0
6 Adult Females	0	0	0	0	0	0
7 Adult Females	0	2^	0	0	0	0

^ some groups had sub-adults

\* some groups had pups

#### *Data summarization methods*

A description and approximate size of the enclosures were requested, with any measurements given converted to total square footage for comparison purposes (Table 3). Enclosure descriptions and measurements varied among institutions as a number of respondents included inside and/or outside holding pens, side yards and multiple exhibit areas, whereas others responded with only a measurement and/or a description of the exhibit. Based upon the range of enclosure sizes received, small (< 5000 sq ft), medium (5000 – 15000 sq ft), and large (> 15000 sq ft) size categories were created for comparison purposes (Table 3). Although there was a total of 21 enclosures among all responses, participants may have listed multiple painted dog groups per institution that were considered distinct from one another, therefore, the corresponding enclosure that each group was housed in was considered a separate

enclosure. Percentages of mixed and single-sex groups that were housed in small, medium, and large enclosures were obtained by tallying the total number of enclosures per size category for mixed sex groups, and following the same procedure for single-sex groups. Next, the total number of enclosures that housed mixed-sex groups was tallied separately from those housing single-sex groups. Each size category total for mixed sex groups was then divided by the total number of mixed sex group enclosures, and the same procedure was followed for single-sex groups. Missing data were not included in any of the calculations for percentages.

Descriptions of enclosure features were also diverse. Some institutions described only one feature, such as water, as being part of their exhibit, while others listed multiple features such as trees, rocks, a pool, and different substrates. If an enclosure description included multiple features, the occurrence of each type of feature was tallied separately within mixed and single-sex groups.

#### *Enrichment Examples for Each Category*

Respondents also listed examples of enrichment options utilized for each of six pre-determined and defined categories (Table 1), the frequency each type was offered, and the perceived success of each category. The enrichment schedule, or frequency, of each type of enrichment was scored on a scale of 0-5: never offered (0), offered less than once a month (1), offered once a month (2), offered multiple times a month (3), offered once a week (4), and offered multiple times a week (5). The totals for each level of frequency for each enrichment category were then tallied (Figure 1).

#### *Perceived Success*

Five of the six categories of enrichment were scored for their perceived success. Although all categories were defined, social (or group composition) enrichment was not included here due to the overlap with behavioral enrichment (training individually or as a group). Perceived success was also

scored by the respondents on a scale of 0-5: not successful or recommended (0), marginally successful (1), hit or miss, meaning it worked for some individuals or on some days, but not others (2), average success (3), moderately successful, meaning there may be minor issues that needed tweaking (4), and highly successful (5). Using a confidence interval (CI) of 95%, the amount of variation about the mean of the success rate was calculated for each enrichment category. Content analysis of the comments and best practices was used for interpretation of the success scores.

Table 3. Enclosure size and features for mixed and single-sex groups.

	Mixed Sex	Single Sex
<b>Comparison of Enclosure Size and Features</b>	Groups	Groups
	(n=28)	(n=17)
<b>Size</b>		
Small (<5000 sq ft)	42%	46%
Medium (5000 - 15000 sq ft)	32%	23%
Large (> 15000 sq ft)	26%	31%
<b>Features</b>		
Naturalistic yard	16	14
Concrete	21	13
Water	5	6
Tunnels	2	1
Trees	3	1
Rocks	7	2
Grass yard	5	1
Different substrates (dirt, gravel, etc)	5	7

## Results

Overall, 21 institutions reported using options from all six categories of enrichment, with all six enrichment categories generally offered multiple times a week (Figure 1). Food and behavioral enrichment were perceived to be the most successful types of enrichment offered, whereas sensory, habitat, and EEDs were perceived as moderately successful (Figure 2).

Group composition varied with mixed sex groups comprising 67% of the total number of painted dog groups, and all female and all male groups comprising 9% and 24% respectively (Table 2). Seventy-four percent of mixed-sex groups and 69% of single-sex groups were housed in the medium size category enclosures of 15,000 sq ft or less (Table 3). Of the 21 reported enclosures described by respondents, 81% described their exhibits as naturalistic and 67% included concrete in some form, whether it was for a pool, holding pen, tunnels, walls, etc. Water, rocks, and different substrates were also frequently utilized in habitats, and similar environments appeared to be offered to both mixed and single-sex groups.

The following paragraphs include examples of suggested successful options from each enrichment category. A few of the more frequently used environmental enrichment devices were boomer balls, boxes, Kongs, and various plastic toys, with the duration of interaction varying among institutions and items. According to respondents, more interaction occurred when food was hidden in any of these items, as well as in paper mache animals. Specifics were not given, but it was also suggested that any items that could be dragged, chewed, tugged, and used for “keepaway” were successful.

Water features such as pools and ponds were examples of positive habitat enrichment, as well as switching or rotating exhibits with other species such as cheetahs. Different substrates such as sand



and mulch, as well as leaf piles and grass clippings, provided opportunities for some individuals to dig and roll. Stacking logs and moving other structures around also elicited positive responses, but with average to moderate success.

Carcasses and bones were perceived to be the two most successful food items, but different methods of food delivery also offered enrichment opportunities. Scattering, burying, or hiding food in trees or under logs, and attaching carcasses to zip-lines were listed as successful options. Puzzle feeders that included bags, tubes, and buckets were also suggested.

Perfume and hunting lures appeared to be highly successful sensory enrichment, although it is unknown what particular scents were utilized at the various institutions. Fecal material and hay from other species such as elephants, rhino, hoofstock and prey animals were also moderately to highly successful. Fresh browse, such as palm fronds, as well as browse taken from other exhibits were utilized with varying success.

Behavioral enrichment occurred both individually and as a group depending on the dynamics of the individual wild dogs involved. Training sessions were given both on and off-exhibit, as well as for public demonstrations. Examples included: target-training, open-mouth, shift, scale, paw, stand, down and hand-injection training.

Similar to behavioral enrichment, individuals were grouped or separated for social enrichment depending on their dynamics. Some groups had to be separated for feeding due to increased aggressive interactions, while others found that group feeding had more positive results and reduced aggression. Having pups and sub-adults as part of a group was listed as the most successful social enrichment by one institution.

Figure 1. Number of institutions reporting each frequency of use category for each enrichment category.

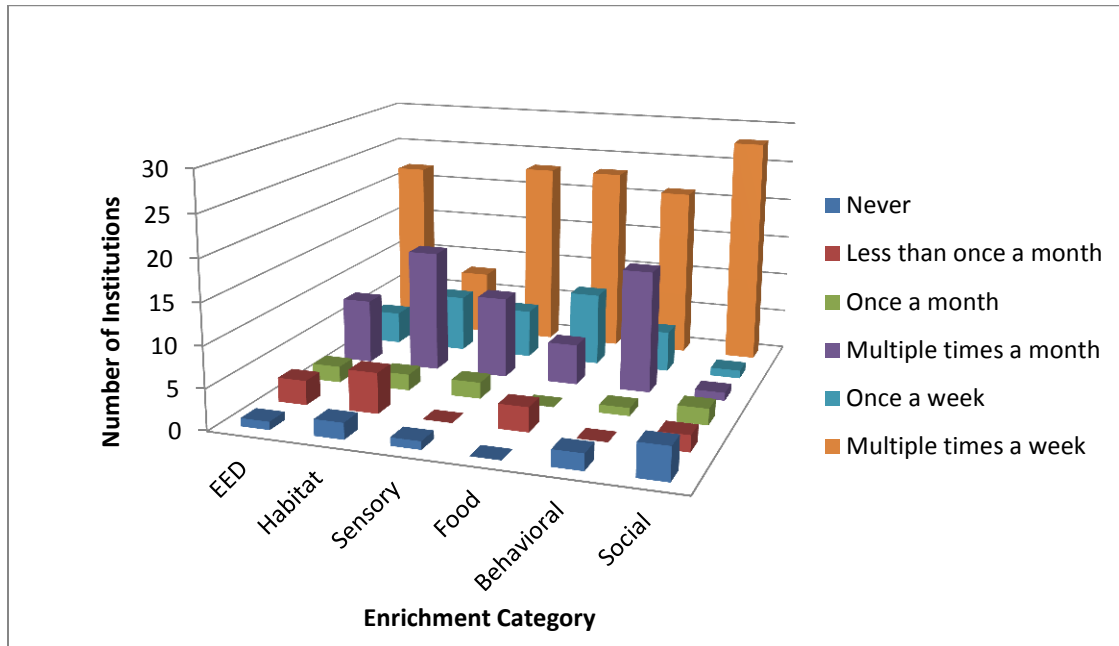
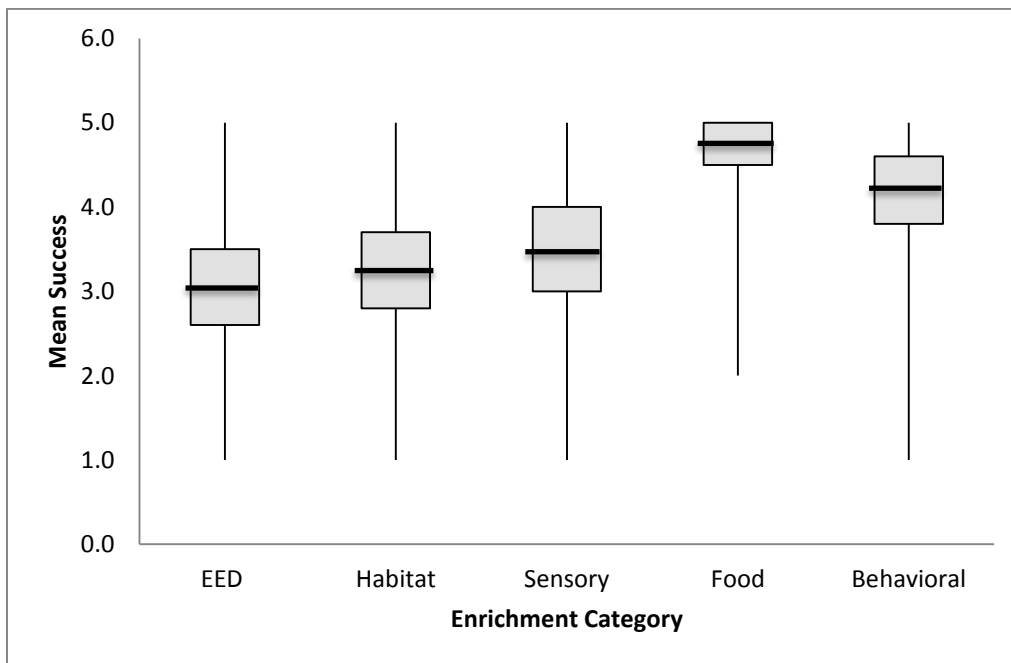


Figure 2. Perceived success of enrichment options. Bars are means, boxes are confidence intervals and vertical lines are ranges.



## Discussion

A variety of painted dog enrichment options, currently or previously in use, for each of the enrichment categories were provided by participants. All six enrichment categories were offered at least multiple times a month, but most offered some form of enrichment multiple times a week with food and behavioral enrichment perceived as the most successful types. The majority of both mixed-sex and single-sex groups were housed in the medium size category enclosures of 15,000 sq. ft. or less. Of the 21 reported enclosures described by respondents, 81% described their exhibits as naturalistic and 67% included concrete in some form, whether it was for a pool, holding pen, tunnels, walls, etc. Water, rocks, and different substrates were also frequently utilized in habitats, and similar environments appeared to be offered to both mixed and single-sex groups. As there was only one previous publication about painted dog enrichment (Shyne & Block 2010), the data compiled in this study not only provides more species-specific information, but may also provide the groundwork for collaboration regarding painted dog enrichment programs.

Group composition may be as important as other forms such as food items and interactive toys. As social carnivores, African painted dog packs can have 20 individuals in a pack, not including pups or yearlings, although this varies depending on resources (Courchamp et al 2002; Creel & Creel 1995; Courchamp & Macdonald 2001). In the wild, there is typically one breeding pair with the rest of the pack acting as helpers to raise their litters, which includes regurgitating food for the female and pups, and having an adult watch the pups while the pack hunts (Courchamp et al. 2002). In comparison, captive packs with one adult male and one adult female (with and without pups and/or sub-adults) made up 50% of the mixed sex groups, with two adult males and one adult female being the next most frequent grouping. Thomas et al. (2006) stated that the majority of captive breeding packs consisted of

one adult female with one or more males, and results from this study indicated that 75% of the breeding painted dog groups had similar compositions. While group composition information is included here, it is beyond the scope of this study to determine the effect that social groupings (age, gender, number of individuals) have on their well-being and how much enrichment it actually provides.

The largest mixed-sex group noted by respondents was 8 adults, which included 7 adult females, 1 adult male and sub-adults (Table 2), and would appear to more closely resemble a pack seen in the wild. While other forms of enrichment may be present, groups that include one adult female and one adult male may lack some of the social enrichment of larger groups. For single-sex groups, there was one group of 5 males, as well as one group of 5 females (Table 2). One question that could be asked is do these individuals derive the social benefits of living in a larger pack even though they are in single-sex groups, or are mixed sex groups necessary to obtain important social aspects? Typically, painted dogs disperse from their natal pack with their same sex siblings, so perhaps captive single sex groups mimic a dispersal group. One of the positive changes in captive pack management is the moving of same sex siblings as a unit rather than individuals among institutions as it is consistent with how painted dogs disperse in the wild (AWDSSP 2011, McNutt 1996; Davies-Mostert et al. 2012), and coincides with Mellen and MacPhee's (2001) suggestion to consider aspects of an animal's natural history when developing programs.

The expectation was that breeding pairs, or groups, would have been housed more frequently in the larger enclosures, but there did not appear to be any relation between group composition (mixed and single sex groups) and enclosure size, as 74% of mixed-sex groups and 69% of single-sex groups were housed in enclosures with an overall size of 15,000 sq ft or less (Table 3). While enclosure size and features were compared among institutions in this study, enclosure designs may also be an important factor to examine in future studies. One stressor of captivity for animals is the limited ability to move away from a source of stress and/or control aspects of their surroundings (Morgan & Tromborg 2007).

As one respondent noted, their painted dog pack seemed to utilize both objects and areas to assist with dealing with aggression. The importance of design may also be demonstrated by the example of the simultaneous raising of two litters within one captive pack of African painted dogs (Thomas et al. 2006). This event was an exception as there is generally only one breeding female in captive, as well as wild, packs (Courchamp & Macdonald 2001). In this instance, enclosure design may have facilitated the rearing of both litters as individuals were able to distance themselves from one another when needed, and the females also had multiple den choices that allowed them to move pups as they wanted (similar to their natural wild behaviors) (Thomas et al. 2006).

Although respondents provided information about their enclosure features and sizes, it is difficult to make comparisons as the same amount of space can be transformed into various designs. However, as noted in previous paragraphs, animals do make use of the space and structures within it. For example, hills, tunnels, and log piles allow individuals to not only distance themselves, but to climb, rest, play, etc., which in turn provides a source of enrichment on its own. According to the responses received, there were no substantial differences between enriched environments for mixed and single-sex groups. The only feature that did stand out was concrete, which is a material that is utilized in different ways throughout enclosures (i.e. walls, moats, tunnels, etc.). Concrete holding pens are an important piece of many enclosures as they allow the painted dogs to be shifted either individually or as a group for various activities such as feeding, husbandry procedures, cage cleaning, and mowing.

The frequency with which each category was offered did not appear to be related to the perceived success of the enrichment. While frequency in this study was categorized by how many days per week or month that enrichment was offered, the time of day that enrichment is given is another consideration (Canino & Powell 2010). Providing enrichment that coincides with an animal's natural activity budget and/or varying the time of day the enrichment is provided may elicit more or different

behavioral responses. As Watters et al. (2011) suggested, some uncertainty in an environment may provide more stimulation than predictability.

As mentioned, a few of the more successful environmental enrichment devices were boomer balls, boxes, and Kongs, with even more interaction when food was included. Although these items were listed as successful, some such as Kongs, tires, fire hose, plastic toys, and cloth were given with caution or stopped altogether at some institutions due to the risk, or actual event of, ingestion/impaction. Items that could be dragged, tugged, or used in “keepaway” and were labeled as successful, could be eliciting some form of their natural hunting and/or foraging behaviors. Rotating exhibits with other species, when possible, provided an opportunity to engage in exploratory behaviors. These types of activities allow painted dogs to engage in and preserve natural behaviors in the proper context (Rabin 2003).

Numerous suggestions were provided, however, a general consensus from caretakers of what constitutes best practices, and “success”, for any form of enrichment in any category are items that train and/or instill natural pack and husbandry behaviors. One respondent noted that due to the high level of intelligence, including training sessions in their enrichment program possibly helped reduce displaced aggression. Enrichment that allowed the painted dogs to perform natural behaviors such as scent marking and foraging were thought to elicit the most reactions and longest duration of interest. Suggestions for best practices include the following: scattering/burying food and/or placing carcasses/hides in trees or on zip-lines which encourage groups to work together to obtain the food item, bones, offering multiple enrichment options to the entire pack, water features (i.e. pools and ponds), paper/cardboard items that they can bite/tear apart (paper bags, phonebooks, boxes, paper towel tubes), areas where the dogs are allowed to dig, and grass clippings if the exhibit was mowed (which also encouraged exploratory behavior of the newly mowed exhibit). Although puppies and sub-adults cannot be part of every pack, one respondent noted how activity levels and enrichment

responsiveness increased with the presence of pups and sub-adults. Lastly, one institution hopes to implement a lure course as another option to burn energy and possibly decrease aggression. One unintentional, but definitely enriching opportunity, was the inadvertent introduction of wild game into two exhibits. In two separate incidences, a peacock and Canada goose entered enclosures which elicited successful hunting responses from the two painted dog groups.

One of the goals of this study was to provide an overview of past and current enrichment options that may assist others with their painted dog enrichment programs. Institutions submitted options that worked, but also described challenges that some are facing. One of the top issues is how to increase the duration of time the dogs spend with various forms of enrichment. Respondents also noted how painted dogs may be more interested in the keepers rather than the items provided, so they have not been able to observe any interaction. One painted dog pack is not comfortable in their holding area, making it difficult to train, while another pack is fearful of too many people, so only one or two keepers may be present at a time. Perhaps if it has not already been attempted, a food-based reward training program, such as the one described by Shyne & Block (2010) for husbandry procedures, could be implemented to aid in increasing the painted dogs' comfort level with both the holding area and people. However, as Mellen and MacPhee (2001) recommend, programs may differ due to an individual painted dog's history and exhibit constraints. The temperaments of each painted dog call for different approaches. One example is a 3.1 pack where aggression has increased with the arrival of the female. Unfortunately, the pack dynamics are such that this group is now managed as a pack with no training currently being offered and no separation of the individuals. Their caretakers are looking for ways to improve the situation. Regrettably, there is no "one size fits all" enrichment program that will meet the needs of every institution and every individual painted dog.

Even if reintroduction is not the end goal of managing a painted dog pack, enrichment that supports their naturally occurring behaviors should be the basis of any enrichment program, and

comments from participants did support this idea. Reading et al. (2013) discussed the low reintroduction success rate of species with complex social structures (such as painted dogs), and those that exhibit higher levels of intelligence and require more training throughout their development. While a low reintroduction success rate is one of multiple conservation concerns for painted dogs (Appendix B; Appendix C), it may also imply an animal welfare concern in that behaviors such as foraging and intra-specific interactions may not be appropriately encouraged and supported (Coelho et al. 2012). As demonstrated by maned wolves, individual variation does play a role. Enrichment offered to multiple maned wolves did modify each of their behaviors, however, the responses differed among them (Coelho et al. 2012). The same appears to be true for painted dogs, and as one participant remarked, they generally seem responsive to environmental stimulus and/or change. By continuing to offer a variety of enrichment options, and collaborating with others within the network, painted dog enrichment programs will continue to develop and enhance the well-being of painted dogs going forward.

## **Conclusions**

- 1.** Although all institutions reported offering enrichment at least multiple times per month, most institutions offered enrichment multiple times per week.
- 2.** Food and behavioral enrichment were perceived as the two most successful enrichment categories.
- 3.** Since there was high variation in responses to enrichment by individual animals, and groups, we recommend finding ways to be innovative, flexible and to experiment with what works for painted dogs at each institution.



## Acknowledgments

I would like to start by thanking Joe Greathouse for his role in suggesting how I could be of assistance to those who work with captive African Painted Dogs, and Mike Quick for endorsing the project, distributing the survey, and allowing me to compile the data for the African Painted Dog SSP. The following also have my gratitude; Juston Wickham, Susan Greathouse, the Birmingham Zoo, Houston Zoo, ABQ BioPark, Knoxville Zoo, Potawatomi Zoo, Sedgwick County Zoo, Endangered Wolf Center, Zoo New England, Denver Zoo, Binder Park Zoo, Topeka Zoo, Good Zoo at Oglebay, Oregon Zoo, San Antonio Zoo, Kansas City Zoo, Phoenix Zoo, Gladys Porter Zoo, Toledo Zoo, The Wilds, Brookfield Zoo, Roger Williams Zoo, Living Desert, and LA Zoo.

Of course, none of this would have been possible without the support and guidance of Dr. Jane M. Packard, who I thank for believing in me in the first place and helping me pursue my passion. The support and feedback from my committee members, Dr. Fran Gelwick and Dr. Kim Dooley, has been greatly appreciated as well.

Finally, I would like to thank Chris and my family and friends who have been supportive throughout this process. I couldn't have done it without all of you.

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## Appendix A:

### Painted Dog (*Lycaon pictus*) Enrichment Survey

<i>This survey is designed to collect the information relevant to management decisions involving behavioral enrichment for Painted Dogs. It should be filled out by a person who knows about current or previous enrichment procedures at your institution. We understand each institution will have different types of information available so please fill out the survey to the best of your ability. We can use partial information. <b>Please return it to:</b> Tammy Cloutier, <a href="mailto:tclout3@tamu.edu">tclout3@tamu.edu</a> (inquire re. FAX)</i>	
<b>Your name:</b>	May we contact you for further details? yes   no
<b>Your institution:</b>	Who else should we contact? _____
<b>Your position:</b>	Position of other contact:
<b>How would you like to be contacted:</b> email   phone   postal <b>Details:</b>	Other contact info:
<b>What is your time-frame?</b> Current enrichment   previous enrichment   both current and previous	
<b>Can you provide assessment reports</b> (eg. Intern projects)? Yes   no   need permission   Attached	

#### Housing Situation at Your Institution

*Describe the social groups and enclosures where behavioral enrichment has been provided for Painted Dogs.*

Group * #	Start-Stop Dates	Group Type	Adult Females	Adult Males	Subadults	Pups	Enclosure Type	Enclosure Size
<i>Example</i>	<i>20Jul11-Present</i>	<i>Eg. Breeding, non-breeding, etc.</i>	<i>1</i>	<i>2</i>	<i>1</i>	<i>0</i>	<i>Naturalistic yard with concrete holding pen, etc.</i>	<i>About 100 ft by 100 ft</i>
1.								
2.								
3.								
4.								
5.								

\*Use these numbers to refer to groups in the Enrichment Schedule (below)

#### Enrichment Schedule

*Use the following codes to fill out the tables based on the frequency of enrichment for each group in table (above):*

<b>NA-</b> No opportunity to observe <b>0-</b> Never <b>1-</b> Less than once a month <b>2-</b> Once a month	<b>3-</b> Multiple times a month <b>4-</b> Once a week <b>5-</b> Multiple times a week	<b>Group 1</b>	<b>Group 2</b>	<b>Group 3</b>	<b>Group 4</b>	<b>Group 5</b>
How often were environmental enrichment devices (EED) provided (e.g. novel or pre-existing objects for manipulation)?						
How often was habitat enrichment provided (e.g. access to a variety of substrates, levels and/or complexities for food caching)?						
How often was sensory enrichment provided (e.g. smell, touch, hearing, vision, taste)?						

How often was food enrichment provided (e.g. fresh, frozen, soft, hard, carcass, bones, puzzle boxes, hidden)?					
How often was social grouping manipulated (e.g. individuals separated for feeding, husbandry, training, combined for play opportunities)?					
How often was behavioral conditioning used (e.g. training sessions to learn new behaviors or maintain established behaviors)?					
Other (please describe):					

### Enrichment Success

*Typical measures of success include: reduced stereotypes, increased activity, improvement in diversity of natural behaviors. In this table, we just want an overall conclusion.*

<b>NA-</b> No opportunity to observe <b>0-</b> Not successful; would not recommend this <b>1-</b> Marginally successful; major problems need to be worked out <b>2-</b> Hit or miss; worked for some individuals (days), not for others <b>3-</b> On the average, worked as well as any other type of enrichment <b>4-</b> Moderately successful; minor issues need tweaking before it is recommended <b>5-</b> Highly successful; recommended enrichment procedure for Painted Dogs	Group 1	Group 2	Group 3	Group 4	Group 5
How successful were environmental enrichment devices (EED)?					
How successful was habitat enrichment?					
How successful was sensory enrichment?					
How successful was food enrichment?					
How successful was behavioral conditioning?					
Other (please describe):					

### Details about Enrichment Procedures (What worked and what did not?)

*Please give the best procedure for each category.*

ENVIRONMENTAL ENRICHMENT DEVICES (EED):
HABITAT:
SENSORY:
FOOD:
BEHAVIORAL CONDITIONING:
OTHER:

### Additional Considerations

*Is there anything else you consider important for the SSP to know about behavioral enrichment for Painted Dogs?*

General Comments:
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## Appendix B

### Natural History and Conservation Challenges of African Painted Dogs



Photo courtesy of Endangered Wolf Center

*"They have a sort of Three Musketeers enthusiasm – all for one and one for all – and it's a totally amazing social structure."*

Quote by Dr. Gregory Rasmussen  
Research Director, Painted Dog Conservation (PDC)

## Natural history of painted dogs

African wild dogs, also called Painted dogs, painted wolves, and Cape hunting dogs, are a member of the Order Carnivora and Family Canidae (IUCN 2013). Although their name implies a close relationship with domestic dogs, African painted dogs are not “dogs” as we know them. Their ancestry can be traced back about 40 million years when the common ancestor between them and wolves and dogs diverged (PDC).

As one of Africa’s most endangered carnivores, Painted dogs were historically distributed throughout most of the African continent (Courchamp et al. 2000). Their current range includes Botswana, Zimbabwe, Namibia, Zambia, Tanzania, and Mozambique (IUCN 2013), and their habitat can be African woodland or open grasslands (Girman et al. 1997).

Painted dogs are social carnivores that average between 40 to 55 pounds (Creel & Creel 1995) and can live in packs of 2 to more than 20 adults (De Villiers et al. 2003). They have variable sized home ranges, which may overlap with other painted dogs (Woodroffe 2011), that can measure from 23 mi<sup>2</sup> to 665 mi<sup>2</sup> (Woodroffe 2011), can travel up to 10 miles in a day (Jackson et al. 2012) and disperse over 50 miles (Davies-Mostert et al. 2012). Vocal communications play an important role in pack unity, and it has been stated that Painted dogs have one of the more complex sound systems in Canidae (Robbins 2000). Vocalizations such as twitters, rumbles, begging cries, and hoos, appear to be unique to them (Robbins 2000).

It has been suggested that a critical pack size of five is necessary for a pack to be reproductively successful (Graf et al. 2006; Courchamp & Macdonald 2001) as they are obligate cooperative breeders (Courchamp, Rasmussen et al. (2002)). Generally there is one breeding pair per pack and all members participate in helping to rear the pups (Creel et al. 1996; Thomas et al. 2006). Towards the end of the gestation period, which is 69-72 days, multiple den sites are checked out until the pregnant female chooses one (McNutt & Boggs 1996). Pups are born black with white spots, are weaned at about 5 weeks of age, and begin to join the pack on hunts around 6 months of age, where they are allowed to feed first (PDC). Until they are old enough, they are guarded at the den site by another adult pack member who acts as a “babysitter” (Courchamp, Rasmussen et al. (2002); McNutt & Boggs 1996). During this period, the pack does not travel as far (usually within 100 km of the den) as others regurgitate food for the mother and pups (McNutt & Boggs 1996). Although subordinates have also been documented giving birth, the survival of their litters is questionable. While litters have been integrated into the breeding female’s litter, others have been killed or successfully raised by the subordinate female (Creel et al. 1996; Thomas et al. 2006; McNutt & Boggs 1996).

Pack members not only care for the breeding female and pups, but also care for their sick and injured (PDC). A pack’s survival can be affected by the loss of just 1 or 2 individuals (Courchamp et al. 2002), and it has been noted that pack members do mourn their deceased (PDC). New packs are formed when same sex sibling groups disperse from their natal packs (De Villiers et al. 2003).

Painted dogs are communal hunters, which may help them to increase the size of the prey that they are able to kill and/or increase their hunting success (Creel & Creel 1995). As generally successful hunters, they have a success rate of 33% to 85% (Creel & Creel 1995; McNutt & Boggs 1996). Hunting usually occurs around dawn and dusk, but Painted dogs have also been seen hunting when there is a full moon (Woodroffe 2011; PDC). Prey varies depending on availability, but includes medium-sized ungulates such as impala, kudu, and wildebeest, as well as warthogs and hares (Creel and Creel (1995), Boggs and McNutt (1996). Painted dogs appear to occur at



Photo courtesy of Phoenix Zoo



low densities in prey-rich areas (Woodroffe 2010), possibly to avoid contact with larger predators (Woodroffe 2011). Although Painted dogs are fairly successful in their hunts, they do suffer kleptoparasitism from other carnivores such as lions, hyenas, and leopards (Buettner et al. 2007; Creel & Creel 1995). Retaining their kill depends on the number of pack members present and the species of carnivore that is attempting to steal the carcass. Predation of Painted dogs by lions occurs (Buettner et al. 2007), although there are circumstances where there is strength in numbers. One example was when a pack of 16 Painted dogs attacked an adult male lion that was stalking their pups (Creel & Creel 1995).

## **Conservation Challenges**

Reserves, parks, and other protected areas offer a level of security for Painted dogs, however, when packs venture outside of these borders, they lose what protection they may have (Woodroffe 2011). Anthropogenic causes such as shooting, poisoning, snaring, and road kills have had, and are still having, an effect on free-ranging Painted dogs (Courchamp et al. 2000). The illegal bushmeat trade along with the perceived and/or actual threat of livestock predation has been detrimental (Woodroffe 2010; Frantzen et al. 2001; Buettner et al. 2007). Painted dogs also utilize roads created by humans, possibly because it assists with traveling and hunting (Woodroffe 2011), which puts them at risk of vehicular collisions. Their social system may also be a factor in their decline as Painted dog packs exist in low densities, but require large areas for home ranges and dispersal (Buettner et al. 2007). The reliance on helpers for successful reproduction, foraging, and protection from natural enemies is another aspect (Courchamp et al. 2000). Habitat fragmentation may coincide with loss of genetic diversity as populations become more isolated (Frantzen et al. 2001). Diseases such as rabies and canine distemper that can be communicated from domestic dogs have also had an impact on their population.

Reintroduction attempts have been somewhat successful, but need to be evaluated and monitored. Failed attempts may have been due to habituation to humans, poor hunting abilities, and lack of positive interspecific interactions (Frantzen et al. 2001). Alternatives are being examined. Adoption of unrelated pups by a pack has been documented in the wild and may be a possible conservation tool (McNutt et al. 2008). Other aspects that may need to be considered are fencing, restocking the prey base in conservation areas, and maintaining packs in confined areas before release to assist with social integration (Gusset et al. 2008). Fencing may keep some individuals from roaming into areas where they are unwanted, while restocking a prey base may encourage them to stay within a certain area. Allowing social integration to occur while in a confined area will assist packs with learning necessary survival skills such as hunting and forming social bonds. Cost may be a factor in the implementation of these suggestions, however, the money earned from ecotourism (and the opportunity to view Painted dogs and other species in the wild) may offset the financial investment (Gusset et al. 2008). Habitat quality and quantity need to be reviewed before releasing any pack anywhere, and the conservation of corridors that allow dispersal should also be considered.

The previous suggestions are important considerations in the conservation of many species, but one of the key components to the success of any reintroduction or conservation program, is education. There are many myths and misconceptions that surround Painted dogs (McNutt & Boggs 1996), as well as socioeconomic issues that threaten their survival (PDC). By educating local communities about the natural behaviors of painted dogs, presenting alternate sources of income, and working with them to prevent and/or decrease human-wildlife conflicts, progress can be made.

## **Organizations**

African Predator Conservation Research Organization (<http://apcro.org/>)



Botswana Predator Conservation Trust (<http://www.bpctrust.org/>)  
Conservation Planning for Cheetah and African Wild Dog ([www.cheetahandwilddog.org](http://www.cheetahandwilddog.org))  
Painted Dog Conservation (<http://www.painteddog.org/>)  
Wildlife Conservation Network (<http://wildlifeconservationnetwork.org/wildlife/africandog2.html>)

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## Appendix C

### CASE STORY AF01: Predator Control: African Painted Dog | Botswana | Zimbabwe | Africa

#### The Conservation Challenge

*“In the same way that the wolf was persecuted in America, Painted Dogs were hunted when the Europeans came to Africa – Dogs were slaughtered in the thousands.” Dr. Gregory Rasmussen<sup>1</sup>*

Despite evidence to the contrary, folklore and myths of long ago still haunt today’s African painted dogs. Unique to Africa, and currently one of the most endangered carnivores on the continent, they are caught in the midst of human and natural enemies. These highly social animals live and hunt in packs and have been documented caring for their own that are sick or injured. Due to this tight-knit social structure, the loss of, or injury to, just one individual can affect the entire pack’s survival.

Development, livestock conflicts, poaching, and diseases, such as rabies and distemper that can kill entire packs, are taking a toll. As the human population continues to grow, so does the need for

resources that will provide housing, food, etc. Increased fragmentation of the natural habitat of these dogs is creating smaller populations that have to travel farther to find mates and other resources, with only a limited number of individuals able to successfully navigate through hazards such as fencing,



roads, and lack of tolerance by humans<sup>2</sup>. Not only do these factors often result in critical loss of life, but they also decrease the genetic diversity needed for long-term reproductive success.

Harsh economic and environmental conditions for humans, combined with generations of cultural beliefs, are creating resistance to coexisting with painted dogs and other predators. Local farmers and ranchers whose survival and livelihoods depend on the livestock they manage, feel the economic loss of each goat, sheep, or cattle – regardless of whether it is through theft, disease, or predators. Although the government offers compensation for livestock losses due to predation, attitudes towards local carnivores have not changed much<sup>3</sup>. Once the painted dogs leave the protected areas, they become targets. A disheartening example in one region was the loss of 25 painted dogs - 19 of which were pups - within three months even though there was no indication they were preying on the livestock, and would have been least likely to do so among the predators present<sup>3</sup>. With only one pack reproducing within Hwange National Park in 2011, incidents such as these have an immense impact on the painted dogs continued existence<sup>4</sup>.

Poaching, whether for illegal or subsistence purposes, is also having a negative impact. Penalties that include 30 days to three months in jail and monetary fines of ten U.S. dollars, along with inadequate enforcement and prosecution, are not sufficient deterrents for illegal activities<sup>4</sup>. Due to unemployment and few other food options, some residents resort to methods such as this to survive. Painted dogs are one of many species who are the unfortunate victims, and possibly unintended targets, of snares.

To assist with decreasing the number of painted dogs being snared, increasing environmental awareness and capacity building among locals is essential for success as “there continues to be a worrisome level of apathy towards the need to protect wildlife. Consequently wildlife resources are dwindling<sup>4</sup>.” However, by increasing the understanding of the importance of the various natural resources in their area, locals can assist with the planning and implementation of management plans that will improve the relationships among all.

## Stakeholder Perspectives

### *Environmental Advocates*

Painted Dog Conservation (PDC) is a non-governmental organization (NGO) that is a proponent of the coexistence of wildlife and people. By utilizing community-based conservation that engages local people at every level, PDC is working towards cultivating a mutually beneficial relationship between local residents and wildlife.

Education is a critical part of PDC’s success and its Educational Outreach Officer plays a key role by visiting all of the local schools that attend the Children’s Bush Camp. Classroom lessons and hands-on activities teach the students about topics such as wildlife and poaching, with a focus on sustainability and biodiversity<sup>1</sup>. Additional programs such as Kids for Science, Nature Corners, Conservation Clubs,



nurseries, and gardens provide opportunities for schools and communities to gain knowledge and skills that help them become involved in local conservation causes<sup>1</sup>.

Along with education, reaching out to the communities as a whole is another important aspect as “...you cannot work in isolation from

the surrounding communities<sup>1</sup>.” PDC’s Community Development Officer works with local communities to increase environmental awareness and economic opportunities. This is accomplished by working with women’s groups to create “sustainable natural resource use and management<sup>1</sup>.” By increasing the quantity of functional boreholes, nutritional gardens are established that not only assist with food security by reducing the need for illegal bushmeat, but also provide an increase in nutritional health and income levels as cash crops are produced.

While building positive relationships with surrounding communities is extremely important for the safety of the painted dogs as they travel, so is checking on the status of the individual dogs themselves. Pack monitoring is performed to assist in keeping track of the locations of various packs as well as the pack members, while anti-poaching units patrol areas to remove snares and traps. Some dogs have also been fitted with anti-snare devices on their collars that catch and break the snare, which have indeed saved the lives of a few individuals. Road signs and reflective collars on the painted dogs also alert the community to their presence in the hopes of both decreasing vehicular collisions and raising awareness that they may be in the area.

For painted dogs that would not be able to survive in the wild for various reasons, the Rehabilitation Center provides a safe haven for those that are sick or injured to heal before being released. In order to ensure that the dogs are prepared for life in the wild, a re-introduction program has been established. Dogs are placed in a natural setting and transition area that allows them to build strength and form new packs. Once they are successfully working as a team, they are released into dog-friendly areas such as Hwange National Park in west-central Zimbabwe.

#### *Local Residents Family Heritage*

Subsistence farmers may not want painted dogs sharing the land due to real or perceived threats to their livestock; however, some may be willing to work with NGOs and others for carnivore conservation depending on the level of involvement required and/or compensation. Livestock husbandry affects predation rates, which in turn affects the number of predators killed. Simple deterrents such as a higher level of human activity near livestock and having guard dogs and bomas (a local term for enclosures) present, methods which some traditional pastoralists do practice, resulted in lower losses of livestock to predators<sup>5</sup>. Along with husbandry techniques, pack monitoring can be an additional tool to notify landowners when painted dogs are in the area and help prevent conflicts.

Ranchers include commercial livestock and game hunting, and PDC does work with ranchers who have painted dog packs on their land. Color-coded collars on the dogs allow the ranchers to identify the different individuals that travel through the area and have assisted with opening up communication regarding predator conservation<sup>1</sup>. In some regions, younger ranchers were more accepting of painted dogs on their land, which may indicate there will be a conservation-minded shift in attitude among younger generations<sup>6</sup>. While there have been positive interactions with ranchers and some recognition of the ecotourism value of the painted dogs, there is still “deep-rooted prejudices<sup>7</sup>.” Lack of control of their environment and being forced to protect species that are viewed as an enemy, justified or not, contributes to the negative perception of allowing predators on or near private property. As expansion into wildlife habitat continues, more human-wildlife interactions can be expected. This could lead to an increase in the number of carnivores being killed due to being labeled “problem” animals even though the actual numbers of livestock lost to predators is unknown. Some deaths that are blamed on lions, painted dogs, and other predators lack evidence and are actually due to theft, animals wandering off, and various other reasons<sup>3</sup>.

As women usually tend to most domestic chores such as caring for children, gathering and cooking food, making purchases for clothing and other household items, etc., they are an important resource in and of themselves. PDC’s work with local women’s groups creates a partnership that assists the women with tasks they are familiar with (such as producing crafts), as well as providing them with new skills and alternate sources of income. Teaching them how to sustainably manage the natural resources they use enables them to provide for their families and community. As local cultural beliefs may differ, it is unclear whether men are supportive of this program and the empowerment it offers to some women.



Lupote Village is adjacent to Hwange National Park which places it directly in a human-wildlife conflict zone as animals leave the protection of the park. Poor soil conditions, inconsistent rainfall, and lack of



employment opportunities contribute to the malnutrition and poverty of this community. With the help of conservation education and skill sharing from PDC, a borehole was drilled to provide a secure water source, and a nutritional garden was created that reduced the need for illegal bushmeat. This resulted in both another food source and alternate income from the sale of the crops. After only three years, the Garden Project was self-sustainable<sup>1</sup>.

The Children's Bush Camps provide an invaluable educational opportunity. Participating schools are able to send their sixth grade classes to camps for one week free-of-charge. While there, the students learn about their environment through lessons, activities, and field trips. For some, this may be the first time they see an elephant, giraffe or painted dog despite the fact that they live in proximity to one another. These camps allow children to make a connection to the world around them and is summed up nicely by the statement that: "Whereas before, locals have been expected to protect something that they had no direct experience with, no emotional attachment to and received no direct benefit from, bush camp alumni will increasingly represent a new generation of villagers over time<sup>1</sup>." Proof that the camps are making a difference are provided in the following two examples; children not allowing their parents to kill a python due to it being an endangered species and having National Park officers safely remove it<sup>4</sup>, and a twelve-year-old girl who vowed to help protect African painted dogs and also saved the life of a kudu caught in a snare, while assisting in the capture of the poacher and finding and removing additional snares<sup>1</sup>!

Education for the communities that live near protected areas is vital to help increase their awareness and involvement. Although conservation efforts and policies may be established with the best of intentions, it is difficult for local communities to support these initiatives if they "do not see any ecological, aesthetical or ethical value<sup>7</sup>" in the natural resources around them. Forcing them to protect carnivores that may or may not have a negative impact on their livelihoods can "often lead to poaching and poor relations with conservation authorities<sup>7</sup>."

#### *Agency Regulators*

The Zimbabwe Parks and Wildlife Management Authority (ZPWMA) is supportive of PDC's conservation efforts for painted dogs, although the desperate lack of financial resources limits their enforcement and capabilities<sup>4</sup>. Pack monitoring and re-introduction give ZPWMA important information regarding painted dog populations. Capacity building that assists with improving the socioeconomic status of local communities not only helps with sustainable resource management, but may assist with building conservation partnerships as people realize they are able to share the land with wildlife. It is uncertain if any local authorities and/or other governmental agencies are involved and/or support programs such as those offered by PDC.

#### *Economic Context and Development Advocates*

Tourism has a great economic impact for both local and non-local people. The beautiful landscape, as



well as the wildlife that cannot be experienced in this way anywhere else, is a huge draw for travelers. While it is difficult not to be in awe of elephants, lions, and herds of ungulates seen in close proximity on safari, painted dogs also have their own charisma and tourists have "expressed overwhelmingly positive opinions about wild dogs<sup>4</sup>." Some travel tour companies have made it a point to include them as part of their guided trips. Local job opportunities are also created as residents may be trained to work at the bush camps and/or as guides<sup>4</sup>.

While open to tourists as well, the Interpretive Hall that is adjacent to PDC's Rehabilitation Facility is also a place for locals to gain an understanding of the Hwange ecosystem they are part of, along with the painted dogs they share it with<sup>1</sup>. Funds raised at the Interpretive Hall are used for the Children's Bush Camps.

The Art Center, located in Dete which is on the border of Hwange National Park, is a beneficial partnership between art and conservation. Local artisans sell quality products which may provide alternate or additional incomes. The majority of materials used are recycled, and items can be purchased locally or internationally. Tourists and locals alike are educated about the painted dogs when visiting or working at the center. A great example of turning a negative into a positive is the snare wire sculptures that are created. Wires that were originally set with the intention to kill are transformed into sculptures that instead assist in conservation efforts. Funds raised not only help the creators of these pieces, but also sustain anti-poaching units. They have even been sold at Christie's Auction in London<sup>1</sup>!

### **Additional Readings:**

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6. Lindsey, A. Attitudes of ranchers towards African wild dogs *Lycaon pictus*: Conservation implications on private land. *Biological Conservation* 125, 113-121 (2005).
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### **Author**

Tammy Cloutier, Texas A&M University, Department of Wildlife & Fisheries Sciences. Contact: [tclout3@tamu.edu](mailto:tclout3@tamu.edu)  
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*In preparation to be posted at:* <http://people.tamu.edu/~j-packard/cases/AF01.painted.dog.Cloutier.pdf>

**Tammy Cloutier**  
**34 Ross Rd**  
**Kennebunk, ME 04043**  
**207.653.6210**  
[tclout33@gmail.com](mailto:tclout33@gmail.com)

**Education**

M.W. S. in Wildlife Science	Dec 2013	Texas A&M University, College Station, TX
B.S. in Psychobiology	Dec 2008	University of New England, Biddeford, ME
A.S. in Veterinary Technology	May 2006	University of Maine Augusta, Bangor, ME
A.A.S. in Computer Technology	Dec 2002	York County Community College, Wells, ME

**Work Experience**

Licensed veterinary technician	March 2006 – Dec 2010	Animal Emergency Clinic, Portland, ME
Admin. Asst./Lab support	Sept 2011 – Sept 2012	IDEXX Laboratories, Westbrook, ME
Administrative Asst.	June 1999 – Dec 2010	Verizon/FairPoint, Portland, ME

**Honors & Awards**

Associate Degree Student of the Year (2005-2006), University College of Bangor  
Veterinary Technology Student of the Year (2005-2006), University College of Bangor

**Presentations**

Enrichment Comparison of African Painted Dogs (*Lycaon pictus*) Housed in U.S. AZA-accredited Institutions (AZA & AAZK Conferences 2013)  
Guest speaker for class of veterinary technician students (presentation on Kenya internship)

**Professional Memberships**

Society of Conservation Biology  
The Wildlife Society  
Defenders of Wildlife  
Association of Zoos & Aquariums (AZA)  
American Association of Zookeepers (AAZK)

**Volunteer/Internship Experience**

Naturalist Certification (in progress)  
Piping Plover Project  
Town of Kennebunk Conservation & Open Space Planning Commission  
Kennebunk Land Trust  
AZA Conservation & Education Internship  
Endangered Species Road Watch  
HERON Observation Network of Maine  
Rachel Carson National Wildlife Refuge  
Maine Wildlife Park

Chemical Immobilization for Wildlife  
School for Field Studies-Wildlife Conservation in Kenya  
Cornell University/Exotics & Wildlife Dept.  
New England Equine Medical & Surgical Center  
Marine Animal Lifeline  
Animal Welfare Society

**Conferences Attended**

Take Action for Animals (July 2009)	Washington, DC
Carnivore Conference (Nov 2009)	Denver, CO
The Wildlife Society (Nov 2011)	Big Island, HI
SCBNA Congress (July 2012)	Oakland, CA
Wildlife Damage Management (March 2013)	Clemson, SC
AZA (Sept 2013)	Kansas City, MO
AAZK (Sept 2013)	Greensboro, NC

**References**

Available upon request