

Population Analysis & Breeding and Transfer Plan

Black Crowned Crane (*Balearica pavonina*) AZA Species Survival Plan® Yellow Program



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PMC

Population Management Center

Lincoln Park
Zoo

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Executive Summary

Species Survival Plan[®] for the Black Crowned Crane (*Balearica pavonina*)

The black crowned crane population at the time of final analysis is 90 (42.46.2) individuals at 34 AZA institutions. The Gruiformes Taxon Advisory Group (TAG) has designated the black crowned crane to be managed as a Population Management Program (PMP) in their 2009 – 2012 Regional Collection Plan (RCP) with a target population size of 130 individuals. This population currently qualifies as a Yellow SSP Program.

Based on an analytical studbook with extensive assumptions, the current black crowned crane population is descended from 24 founders with 6 potential founders remaining in the population. Efforts should be made to recruit these potential founders into the breeding population. The current gene diversity of the descendant population is about 96%. This current gene diversity is equivalent to that of 13 - 14 unrelated animals (FGE=13.46). Long-term projections based on a growth rate of approximately 2% ($\lambda = 1.02$) and a target size of 130, indicate that gene diversity will decline to approximately 86% over the next 100 years. When gene diversity falls below 90% of that in the founding population, it is expected that reproduction and survival may be increasingly compromised.

Demography

Current size of population (N) – Total (Males.Females.Unknown Sex)	90 (42.46.2)
Number of individuals excluded from management	15
Population size following exclusions	75 (35.40.0)
Target population size (Kt)	130
Mean generation time (years)	18.8
Historical/Potential population growth rate (λ)	0.979 / 1.02

Genetics*

	Current	Potential
Current Founders	24	6
Founder genome equivalents (FGE)	13.46	26.36
Gene diversity (GD %)	96.26	98.10
Population mean kinship (MK)	0.0371	--
Mean inbreeding (F)	0.000	--
Effective population size/census size ratio (N_e / N)	0.2000	--
Percentage of pedigree known before assumptions & exclusions	36.4	--
Percentage of pedigree known after assumptions & exclusions	94.9	--
Years To 90% Gene Diversity	54	--
Years to 10% Loss of Gene Diversity	98	--
Gene Diversity at 100 Years From Present (%)	85.88	--
Assumptions used for genetic projections	$\lambda = 1.02$, Target size = 130	--

*based on analytical studbook.

Demographic analyses indicate that at least 8 hatches in the coming year are required to maintain the current population size. To achieve an annual population growth rate of approximately 2% ($\lambda=1.02$) and reach the target population size of 130 in 20 years, approximately 10 - 12 hatches are needed in the coming year.

There are currently 12 individuals in the population that have 100% unknown pedigree and 6 individuals with 50% unknown pedigree. At this time these animals have been excluded from the breeding population, as breeding these individuals will perpetuate unknownness within the population. Institutions are highly encouraged to investigate the origins of their unknown pedigree animals in order to help determine relatedness and genetic importance of animals within the living population.

Where possible, existing breeding groups were left together and breeding recommendations were prioritized to maintain or increase gene diversity through consideration of mean kinship (prioritizing breeding for low mean kinship animals and minimizing differences in sire and dam mean kinships) and avoidance of inbreeding. Institutions recommended to breed are expected to hold offspring for at least one year.

Summary Actions: The Program recommends 20 females for breeding. Institutions are recommended to produce one clutch from each recommended pairing, then contact the SSP Coordinator for additional recommendations. In addition, 15 transfers are recommended to facilitate new breeding or to meet institutional requests.

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Acknowledgments

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The black crowned crane planning meeting was held at Lincoln Park Zoo 15 July 2011, attended by:

Laura Reisse, SSP Coordinator/Studbook Keeper, Henry Vilas Zoo
Claire Mirande, International Crane Foundation
Matt Hayes, International Crane Foundation
Tori Spinoso, International Crane Foundation
Kim Boardman, International Crane Foundation
Katelyn Marti, Population Management Center, Lincoln Park Zoo
Kaitlyn Perisin, Alexander Center, Lincoln Park Zoo

An additional meeting was held via internet and phone conference 20 July 2011, attended by:

Laura Reisse, SSP Coordinator/Studbook Keeper, Henry Vilas Zoo
Katelyn Marti, Population Management Center, Lincoln Park Zoo
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Cover Photo courtesy of the International Crane Foundation.

This plan was prepared and distributed with the assistance of the AZA Population Management Center in Chicago.

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Description of Population Status

Species Survival Plan[®] for the Black Crowned Crane (*Balearica pavonina*)

Introduction: The black crowned crane population at the time of final analyses is 90 animals (42 males, 46 females, and 2 unknown sex) at 34 AZA institutions. The Gruiformes Taxon Advisory Group (TAG) has designated the black crowned crane to be managed as a Population Management Program (PMP) in their 2009 – 2012 Regional Collection Plan (RCP) with a target population size of 130 individuals. This population currently qualifies as a Yellow SSP Program.

Comprehensive genetic and demographic analyses of the black crowned crane population were performed in October 2011, resulting in the current breeding and transfer plan for this species. Analyses of the North American Black Crowned Crane Studbook (current to June 2011) were performed using PopLink 2.1, SPARKS 1.5, and PM2000 1.213. This is the first breeding and transfer plan for the black crowned crane. Recommendations proposed in a Yellow SSP Plan are non-binding; participation is voluntary.

Analytical Studbook: An analytical studbook was created for genetic analysis to incorporate assumptions regarding pedigree unknownness within the black crowned crane population (Appendix A). Extensive assumptions were created for 25 individuals to resolve pedigree unknownness within the managed population. With the application of these assumptions, the population went from 36% pedigree known to 78% known.

There are currently 12 individuals in the population that have 100% unknown pedigree. At this time these animals have been excluded from the breeding population, continued breeding these individuals will perpetuate unknownness within the population. Institutions with unknown pedigreed individuals are encouraged to investigate the origins of their animals in order to help determine relatedness and genetic importance of these animals within the living population. An additional three individuals were excluded from the potentially breeding population due to their participation in educational programs (Appendix C). After exclusions and the application of assumptions, the potentially breeding black crowned crane population consists of 75 (35.40.0) individuals and is 95% known.

Demography: Black crowned cranes were first seen in North American zoos in 1905. However, this species was not held in large numbers until the 1950s and the first captive hatch did not occur until 1960. Due to zoo breeding and importations from the wild, the population grew rapidly to a peak size of 145 in 1982. Since this time, the population has been experiencing periods of rapid increase and sharp decline, due to a decrease in the number of wild hatched animals and varied rates of breeding success, with growth rates over the last 20 years ranging from 0.909 – 1.064 (Figures 1 and 2). Over the last 5 years, the population's yearly lambdas have ranged from 0.970 - 1.064 and the overall growth trend has been remaining stable ($\lambda=1.002$).

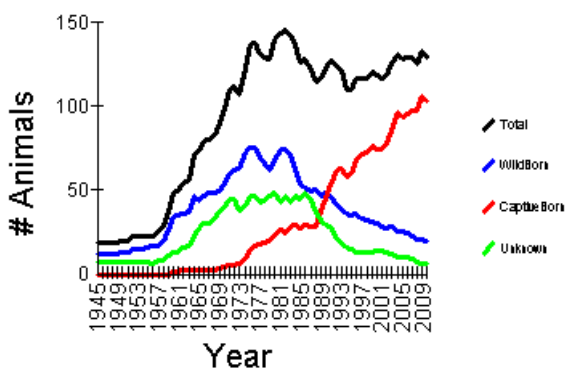


Figure 1. Census of black crowned crane population in AZA by hatch type. Reflecting studbook data which contains data from 1945 – present.

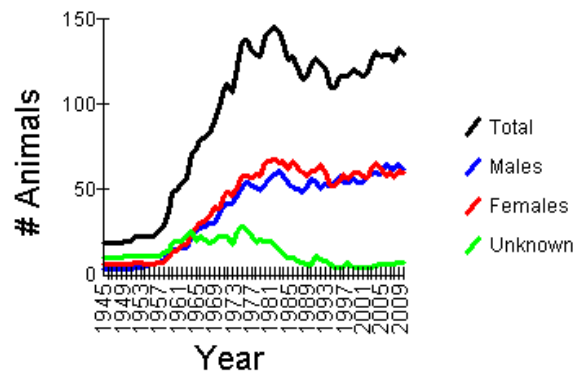


Figure 2. Census of black crowned crane population in AZA by sex. Reflecting studbook data which contains data from 1945 – present.

Demographic projections estimate that to keep this population stable (0% growth); at least 8 hatches in the coming year are necessary. According to studbook data, the AZA black crowned crane typically has 1 to 2 chicks per clutch with a mean of 1.7 chicks per clutch. Over the past 10 years, the AZA population has had an average of approximately 10 chicks per year (6 – 16 hatches). A growth rate of 2% ($\lambda = 1.02$) appears reasonable based on the clutch averages, the space available for this species, and demand in the near future, requiring 10 - 12 hatches in the coming years and allowing the population to reach the target population size of 130 in approximately 20 years.

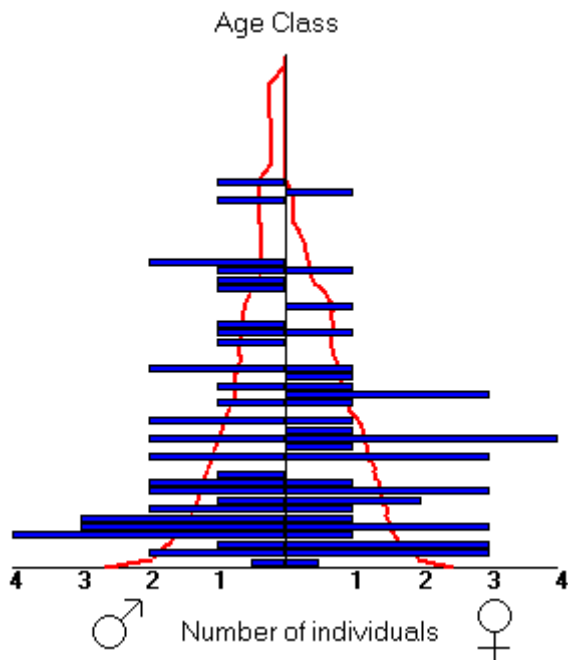


Figure 3. Age structure of the potentially breeding AZA black crowned crane population 75 animals (35 males and 40 females) showing age classes 0 – 57.

The age structure of this population approximates a relatively stable distribution with a wide base of juveniles which will mature to reach the reproductive age classes (Figure 3). However, there are several empty age classes throughout the structure. While gaps are expected in a long-lived species such as this, they could limit breeding until younger animals grow old enough to begin filling these gaps and breed. The Program should focus on producing a steady amount of hatches in order to continue this broad base and continue to fill of the breeding age classes in the future.

Based on studbook data from 1970 to present, juvenile mortality for the black crowned cranes is 38% for males and 31% for females (Appendix D). The oldest recorded male in the black crowned crane population lived to be 56 years old; this individual was wild caught with a year age estimate. The oldest female in the population is still living at 41 years old (#172), she also was wild caught with a year age estimate. Both male and female black crowned crane have been recorded as breeding as young as 4 years of age, though typically they do not become reproductively mature until 5 or 6. The oldest male in the population to have bred was 33 years old at the time of conception (year age estimate). The oldest female black crowned crane to breed was 34 years old at the time of the offspring's hatch.

GENETIC SUMMARY	Current	Potential
Current Founders	24	6
Founder genome equivalents (FGE)	13.46	26.36
Gene diversity (GD %)	96.26	98.10
Population mean kinship (MK)	0.0371	--
Mean inbreeding (F)	0.000	--
Effective population size/census size ratio (N_e / N)	0.2000	--
Percentage of pedigree known before assumptions & exclusions	36.4	--
Percentage of pedigree known after assumptions & exclusions	94.9	--
Years To 90% Gene Diversity	54	--
Years to 10% Loss of Gene Diversity	98	--
Gene Diversity at 100 Years From Present (%)	85.88	--
Assumptions used for genetic projections	$\lambda = 1.02$, Target size = 130	--

*Based on analytical studbook

Genetics: The potentially breeding black crowned crane population is descended from 24 founders with 6 additional potential founders remaining in the population (Figure 4). Current gene diversity in the population is approximately 96%, equivalent to that found in 13 – 14 unrelated individuals (FGE = 13.46). The number of founders represented in this population is relatively high; this however is not represented in the founder genome equivalent statistic. The FGE is low due to several founder lineages having produced significantly more offspring than any other lineage in the population. By pairing individuals from the founder lineages with fewer relatives (those with lower mean kinship values) and by pairing and recruiting potential founders, a large amount of this population’s potential gene diversity (98% GD or 26 FGE) could be tapped into.

Long-term projections indicate that gene diversity would decrease to approximately 86% in 100 years (assuming growth rate of 1.02 and a target size of 130). When gene diversity falls below 90% of that in the founding population, it is expected that reproduction will be increasingly compromised by, among other factors, lower hatch weights, and greater neonatal mortality.

To retain gene diversity for a longer period of time and possibly recruit additional potential gene diversity, potential founders should be recruited into the breeding population and animals with low mean kinship values should be paired and prioritized for breeding in order to equalize the different founder lineages. Other strategies that could reduce the loss of gene diversity include; increasing the number of individuals breeding, growing the population at a faster rate, and acquiring additional founders. The population’s current effective size to current population size ratio (Ne/N) is 0.2000, reflecting the fact that 20% of the individuals in population has bred and have living offspring. Currently this percentage is based on 6 females breeding and 9 males contributing their genes. Increasing the Ne/N ratio could increase the retention of gene diversity over time.

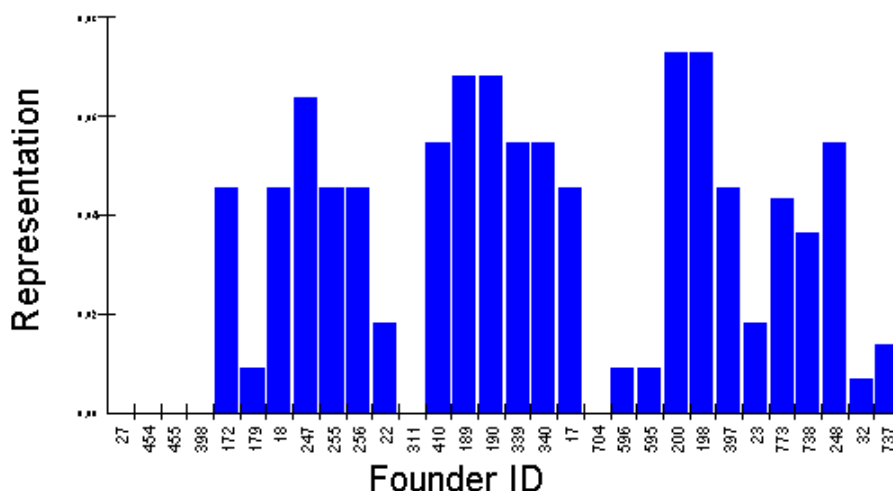


Figure 4. Founder representation graph illustrating the inequality of the 24 founder and 6 potential founder lineages represented in the current black crowned crane population.

Management Strategy: The current black crowned crane population is 90 individuals (42 males, 46 females, and 2 unknown sex) at 34 AZA institutions. The population is descended from 24 founders and gene diversity in the descendant population is approximately 96%. Demographic analyses indicate that at least 8 hatches in the coming year are required to maintain the current population size ($\lambda = 1.00$). To increase the population to the target size of 130 in the next 20 years ($\lambda = 1.02$), approximately 10 -12 hatches are needed in the coming years.

There are currently 12 individuals in the population that have 100% unknown pedigree. At this time these animals have been excluded from the breeding population, as breeding these individuals will perpetuate unknownness. It is recommended that institutions refrain from breeding these individuals if possible and investigate the origins of these unknown pedigree animals in order to help determine relatedness and genetic importance of animals within the living population.

Pairings have been recommended with the consideration of mean kinship, maximum avoidance of inbreeding, differences in sire and dam mean kinships, and the needs of individual institutions in an attempt to maintain gene diversity for as long as possible. This is the first breeding and transfer plan for the Black Crowned Crane Program.

1. Recommends 20 females for breeding.
 - a. Recommends institutions contact the SSP Coordinator after each successful clutch. Breeding may be increased or decreased depending on the overall reproductive success across the population.
 - b. Institutions recommended to breed are expected to hold offspring for at least 1 year.
 - c. Offspring produced by non-recommended pairings will not be prioritized for placement.
 - d. Several breeding pairs are currently mismatched or over-represented at this time; they are recommended to breed for demographic purposes. As a result these pairs may be repaired in the future as more suitable mates become available.
 - e. To encourage breeding behavior, institutions with birds not recommended to breed are encouraged to allow these individuals to partake in the typical breeding cycle (nest building, laying eggs, etc.) all eggs should then be removed.
2. Recommends 15 transfers within the Program to address institutional requests or to make new companion or breeding pairs.
3. The Program recommends that all institutions confirm the species of crowned crane they currently display. The two species, black-crowned cranes and grey- crowned cranes are morphologically similar; however there are several differences that are easily identified.
 - a. If institutions would like to confirm the species of their individuals they are recommended to refer to savingcranes.org for descriptions of grey and black –crowned cranes.
4. Institutions interested in obtaining or placing black crowned crane should contact the SSP Coordinator to coordinate transfers that will facilitate genetic and demographic stability.
 - a. This species may be housed in mixed exhibits, see Appendix F for more information regarding possible mixed species scenarios and contact the SSP Coordinator with any questions.
5. For information regarding diet items currently being fed to this species see Appendix F which contains data collected via survey from holding institutions. Contact the SSP Coordinator with any questions.
6. Institutions are encouraged to investigate the origins of their unknown pedigree animals in order to help determine relatedness and genetic importance of animals within the living population.
 - a. Animals coming from unknown sources, private breeders, or dealers often cannot be assumed to be unrelated to the zoo population. Institutions considering obtaining individuals from these sources should make every effort to determine pedigree information for the genetic health of the population.

SUMMARY OF BREEDING AND TRANSFER RECOMMENDATIONS

By Studbook ID

Institutions are asked contact the SSP Coordinator after each successful clutch.

ID	Location	Sex	Age	Disposition	Location	Breeding	With	Notes
18	LOSANGELE	M	34	HOLD	LOSANGELE	DO NOT BREED		
22	OMAHA	M	32	HOLD	OMAHA	BREED WITH	360, 311	
27	MEMPHIS	F	0	HOLD	MEMPHIS	BREED WITH	712	Potential Founder
35	LVZOO	F	29	HOLD	LVZOO	DO NOT BREED		Excluded - 100% unknown pedigree
37	LVZOO	M	27	HOLD	LVZOO	DO NOT BREED		Excluded - 100% unknown pedigree
40	ALEXANDRI	F	0	SEND TO	BROWNSVIL	DO NOT BREED		Excluded - 100% unknown pedigree
51	BROWNSVIL	M	22	HOLD	BROWNSVIL	DO NOT BREED		
172	BIRMINGHM	F	42	HOLD	BIRMINGHM	BREED WITH	261	
179	ALEXANDRI	M	41	HOLD	ALEXANDRI	BREED WITH	452	
247	SAN ANTON	M	34	HOLD	SAN ANTON	DO NOT BREED		
255	SAN FRAN	F	33	HOLD	SAN FRAN	BREED WITH	256	
256	SAN FRAN	M	33	HOLD	SAN FRAN	BREED WITH	255	
261	PHILADELP	M	31	SEND TO	BIRMINGHM	BREED WITH	172	
311	BROWNSVIL	F	26	SEND TO	OMAHA	BREED WITH	22, 451	Potential Founder
314	METROZOO	M	25	HOLD	METROZOO	DO NOT BREED		Excluded - 100% unknown pedigree
325	SOUTHBEND	M	10	HOLD	SOUTHBEND	DO NOT BREED		Excluded - 100% unknown pedigree
339	SD-WAP	M	22	HOLD	SD-WAP	BREED WITH	340	
340	SD-WAP	F	22	HOLD	SD-WAP	BREED WITH	339	
345	SAN ANTON	F	21	HOLD	SAN ANTON	DO NOT BREED		
346	BALTIMORE	F	20	HOLD	BALTIMORE	BREED WITH	749	
352	HOUSTON	M	20	SEND TO	DALLAS	BREED WITH	720	
360	PHILADELP	F	19	SEND TO	OMAHA	BREED WITH	451, 22	
398	ST PAUL	M	43	HOLD	ST PAUL	BREED WITH	704	Potential Founder
410	AUDUBON	M	26	HOLD	AUDUBON	BREED WITH	474	
415	LUFKIN	F	19	HOLD	LUFKIN	BREED WITH	438	
438	LUFKIN	M	16	HOLD	LUFKIN	BREED WITH	415	
442	SOUTHBEND	F	15	HOLD	SOUTHBEND	DO NOT BREED		
451	OMAHA	M	14	HOLD	OMAHA	BREED WITH	360, 311	
452	OMAHA	F	14	SEND TO	ALEXANDRI	BREED WITH	179	
454	BOISE	F	0	HOLD	BOISE	BREED WITH	455	Potential Founder
455	BOISE	M	0	HOLD	BOISE	BREED WITH	454	Potential Founder
458	DISNEY AK	F	14	HOLD	DISNEY AK	DO NOT BREED		
460	BARABOO	M	14	SEND TO	ALEXANDRI	BREED WITH	762	
462	DISNEY AK	F	14	HOLD	DISNEY AK	DO NOT BREED		
465	BARABOO	F	13	HOLD	BARABOO	DO NOT BREED		
471	COLUMBUS	F	13	HOLD	COLUMBUS	DO NOT BREED		Excluded - Education
474	AUDUBON	F	12	HOLD	AUDUBON	BREED WITH	410	
476	DISNEY AK	M	12	HOLD	DISNEY AK	DO NOT BREED		
485	CHEHAW	M	12	HOLD	CHEHAW	DO NOT BREED		
486	SEDGWICK	F	12	HOLD	SEDGWICK	BREED WITH	768	
487	MINOT	F	12	HOLD	MINOT	DO NOT BREED		
494	BREVARD	M	9	HOLD	BREVARD	BREED WITH	694	
530	BUSCH TAM	F	14	HOLD	BUSCH TAM	DO NOT BREED		
543	METROZOO	F	16	HOLD	METROZOO	DO NOT BREED		Excluded - 100% unknown pedigree
574	LUFKIN	M	16	HOLD	LUFKIN	BREED WITH	765	

ID	Location	Sex	Age	Disposition	Location	Breeding	With	Notes
659	PUEBLA	M	18	HOLD	PUEBLA	DO NOT BREED		
687	BUSCH TAM	F	7	HOLD	BUSCH TAM	DO NOT BREED		
690	SD-WAP	F	9	HOLD	SD-WAP	BREED WITH	763, 802	
692	SAN ANTON	M	9	HOLD	SAN ANTON	BREED WITH	795	
693	BALTIMORE	F	9	HOLD	BALTIMORE	DO NOT BREED		Excluded - Education
694	BREVARD	F	8	HOLD	BREVARD	BREED WITH	494	
699	PROVIDNCE	F	8	HOLD	PROVIDNCE	DO NOT BREED		
701	PROVIDNCE	M	8	HOLD	PROVIDNCE	DO NOT BREED		Excluded - 100% unknown pedigree
704	ST PAUL	F	19	HOLD	ST PAUL	BREED WITH	398	Potential Founder
706	ST AUGUST	M	7	HOLD	ST AUGUST	DO NOT BREED		Excluded - 100% unknown pedigree
708	SD-WAP	F	7	HOLD	SD-WAP	BREED WITH	802, 763	
712	MEMPHIS	M	6	HOLD	MEMPHIS	BREED WITH	27	
717	DISNEY AK	M	6	HOLD	DISNEY AK	DO NOT BREED		Excluded - 100% unknown pedigree
720	DALLAS	F	6	HOLD	DALLAS	BREED WITH	352	
726	BATTLE CR	M	5	HOLD	BATTLE CR	DO NOT BREED		
729	SD-WAP	M	5	SEND TO	BARABOO	DO NOT BREED		Excluded - 100% unknown pedigree
730	BUSCH TAM	F	5	HOLD	BUSCH TAM	DO NOT BREED		
735	BALTIMORE	M	4	HOLD	BALTIMORE	DO NOT BREED		
736	MINOT	M	4	HOLD	MINOT	DO NOT BREED		
739	BIRMINGHM	M	4	HOLD	BIRMINGHM	DO NOT BREED		
741	BIRMINGHM	F	4	HOLD	BIRMINGHM	DO NOT BREED		
742	ALEXANDRI	F	0	SEND TO	LOSANGELE	DO NOT BREED		Excluded - 100% unknown pedigree
746	SAN ANTON	F	4	HOLD	SAN ANTON	DO NOT BREED		
749	BALTIMORE	M	8	HOLD	BALTIMORE	BREED WITH	346	
750	BALTIMORE	F	8	HOLD	BALTIMORE	DO NOT BREED		
751	DREHER PA	M	5	SEND TO	BUSCH TAM	DO NOT BREED		
761	ST AUGUST	F	4	HOLD	ST AUGUST	DO NOT BREED		
762	ALEXANDRI	F	18	HOLD	ALEXANDRI	BREED WITH	460	
763	SD-WAP	M	3	HOLD	SD-WAP	BREED WITH	690, 708	
765	LUFKIN	F	3	HOLD	LUFKIN	BREED WITH	574	
768	SEDGWICK	M	3	HOLD	SEDGWICK	BREED WITH	486	
769	BUSCH TAM	M	3	HOLD	BUSCH TAM	DO NOT BREED		
771	COLUMBUS	M	3	HOLD	COLUMBUS	DO NOT BREED		
785	DENVER	M	2	HOLD	DENVER	DO NOT BREED		Potential future breeder with 799
786	DALLAS	U	2	HOLD	DALLAS	DO NOT BREED		This individual will return to WORLDBIRD in the fall of 2011. Excluded - Education
791	COLUMBUS	F	2	HOLD	COLUMBUS	DO NOT BREED		
795	SD-WAP	F	2	SEND TO	SAN ANTON	BREED WITH	692	
796	AUDUBON	F	1	SEND TO	CHEHAW	DO NOT BREED		
797	AUDUBON	F	1	SEND TO	CHEHAW	DO NOT BREED		
799	SAN ANTON	F	1	SEND TO	DENVER	DO NOT BREED		
800	BUSCH TAM	M	1	HOLD	BUSCH TAM	DO NOT BREED		
802	SD-WAP	M	1	HOLD	SD-WAP	BREED WITH	708, 690	
805	LVZOO	U	0	HOLD	LVZOO	DO NOT BREED		Excluded - 100% unknown pedigree
806	SAN FRAN	F	2	HOLD	SAN FRAN	DO NOT BREED		
809	SD-WAP	F	0	SEND TO	BATTLE CR	DO NOT BREED		

RECOMMENDATIONS BY INSTITUTION

ALEXANDRI

Alexandria Zoological Park
Alexandria, LA

Note: Please contact the SSP Coordinator after each successful clutch.

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
179	487211	M	41	HOLD	ALEXANDRI	BREED WITH	452	
762	487213	F	18	HOLD	ALEXANDRI	BREED WITH	460	
40	233070	F	0	SEND TO	BROWNSVIL	DO NOT BREED		Excluded - 100% Unknown Pedigree
742	AV0020	F	0	SEND TO	LOSANGELE	DO NOT BREED		Excluded - 100% Unknown Pedigree
460	010014	M	14	RECEIVE FROM	BARABOO	BREED WITH	762	
452	9630	F	14	RECEIVE FROM	OMAHA	BREED WITH	179	

AUDUBON

Audubon Zoo
New Orleans, LA

Note: Please contact the SSP Coordinator after each successful clutch.

Pair 410 and 474 are currently genetically mismatched. They are recommended to breed this year for demographic purposes, though they may be repaired in the future.

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
410	2196	M	26	HOLD	AUDUBON	BREED WITH	474	
474	100044	F	12	HOLD	AUDUBON	BREED WITH	410	
796	103197	F	1	SEND TO	CHEHAW	DO NOT BREED		
797	103198	F	1	SEND TO	CHEHAW	DO NOT BREED		

BALTIMORE

The Maryland Zoo in Baltimore
Baltimore, MD

Note: Please contact the SSP Coordinator after each successful clutch.

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
346	5844	F	20	HOLD	BALTIMORE	BREED WITH	749	
749	5482	M	8	HOLD	BALTIMORE	BREED WITH	346	
735	5845	M	4	HOLD	BALTIMORE	DO NOT BREED		
750	5483	F	8	HOLD	BALTIMORE	DO NOT BREED		
693	5666	F	9	HOLD	BALTIMORE	DO NOT BREED		Excluded - Education

BARABOO

International Crane Foundation
Baraboo, WI

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
465	010015	F	13	HOLD	BARABOO	DO NOT BREED		
460	010014	M	14	SEND TO	ALEXANDRI	BREED WITH	762	
729	807023	M	5	RECEIVE FROM	SD-WAP	DO NOT BREED		Excluded - 100% Unknown Pedigree

BATTLE CR

Binder Park Zoo
Battle Creek, MI

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
726	B11004	M	5	HOLD	BATTLE CR	DO NOT BREED		
809	811183	F	0	RECEIVE FROM	SD-WAP	DO NOT BREED		

BIRMINGHM

Birmingham Zoo
Birmingham, AL

Note: Please contact the SSP Coordinator after each successful clutch.

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
172	400	F	42	HOLD	BIRMINGHM	BREED WITH	261	
739	208009	M	4	HOLD	BIRMINGHM	DO NOT BREED		
741	208010	F	4	HOLD	BIRMINGHM	DO NOT BREED		
261	203172	M	31	RECEIVE FROM	PHILADELP	BREED WITH	172	

BOISE

Zoo Boise
Boise, ID

Note: Please contact the SSP Coordinator after each successful clutch.

Both of these individuals are potential founders and all efforts should be made to encourage breeding. Please contact the SSP Coordinator with any questions.

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
454	970146	F	0	HOLD	BOISE	BREED WITH	455	Potential Founder
455	970145	M	0	HOLD	BOISE	BREED WITH	454	Potential Founder

BREVARD

Brevard Zoo
Melbourne, FL

Note: Please contact the SSP Coordinator after each successful clutch.

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
494	2303	M	9	HOLD	BREVARD	BREED WITH	694	
694	24016	F	8	HOLD	BREVARD	BREED WITH	494	

BROWNSVIL

Gladys Porter Zoo
Brownsville, TX

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
51	4705	M	22	HOLD	BROWNSVIL	DO NOT BREED		
311	2443	F	26	SEND TO	OMAHA	BREED WITH	22, 451	Potential Founder
40	233070	F	0	RECEIVE FROM	ALEXANDRI	DO NOT BREED		Excluded - 100% unknown pedigree

BUSCH TAM

Busch Gardens Tampa Bay
Tampa, FL

Note: Current male is genetically over-represented is inbred with two out of the three females. The Program will continue to seek appropriate mates for these individuals.

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
530	59947	F	14	HOLD	BUSCH TAM	DO NOT BREED		
687	62722	F	7	HOLD	BUSCH TAM	DO NOT BREED		
730	63409	F	5	HOLD	BUSCH TAM	DO NOT BREED		
769	64393	M	3	HOLD	BUSCH TAM	DO NOT BREED		
800	64927	M	1	HOLD	BUSCH TAM	DO NOT BREED		
751	207024	M	5	RECEIVE FROM	DREHER PA	DO NOT BREED		

CHEHAW

Chehaw Wild Animal Park
Albany, GA

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
485	B00001	M	12	HOLD	CHEHAW	DO NOT BREED		
796	103197	F	1	RECEIVE FROM	AUDUBON	DO NOT BREED		
797	103198	F	1	RECEIVE FROM	AUDUBON	DO NOT BREED		

COLUMBUS

Columbus Zoo and Aquarium
Powell, OH

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
771	109053	M	3	HOLD	COLUMBUS	DO NOT BREED		
791	110057	F	2	HOLD	COLUMBUS	DO NOT BREED		
471	991027	F	13	HOLD	COLUMBUS	DO NOT BREED		Excluded - Education

DALLAS

Dallas Zoo
Dallas, TX

Note: Please contact the SSP Coordinator after each successful clutch.

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
786	11K786	U	2	HOLD	DALLAS	DO NOT BREED		This individual will return to WORLDBIRD in the fall of 2011. Excluded - Education
720	09K010	F	6	HOLD	DALLAS	BREED WITH	352	Genetically valuable pairing
352	20040	M	20	RECEIVE FROM	HOUSTON	BREED WITH	720	

DENVER

Denver Zoological Gardens
Denver, CO

Note: Please contact the SSP Coordinator after each successful clutch.

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
799	L10086	F	1	RECEIVE FROM	SAN ANTON	DO NOT BREED		Potential future breeding pair. Contact SSP Coordinator when birds begin displaying breeding behavior. Currently genetically over-represented.
785	A10259	M	2	HOLD	DENVER	DO NOT BREED		

DISNEY AK**Disney's Animal Kingdom**

Bay Lake, FL

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
458	980382	F	14	HOLD	DISNEY AK	DO NOT BREED		
462	980386	F	14	HOLD	DISNEY AK	DO NOT BREED		
476	000301	M	12	HOLD	DISNEY AK	DO NOT BREED		
717	060221	M	6	HOLD	DISNEY AK	DO NOT BREED		Excluded - 100% Unknown Pedigree

DREHER PA**Palm Beach Zoo at Dreher Park**

West Palm Beach, FL

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
751	207024	M	5	SEND TO	BUSCH TAM	DO NOT BREED		

HOUSTON**Houston Zoo, Inc.**

Houston, TX

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
352	20040	M	20	SEND TO	DALLAS	BREED WITH	720	

LOSANGELE**Los Angeles Zoo & Botanical Gardens**

Los Angeles, CA

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
18	001167	M	34	HOLD	LOSANGELE	DO NOT BREED		
742	AV0020	F	0	RECEIVE FROM	ALEXANDRI	DO NOT BREED		Excluded - 100% Unknown Pedigree

LUFKIN**Ellen Trout Zoo**

Lufkin, TX

Note: Please contact the SSP Coordinator after each successful clutch.

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
415	08377	F	19	HOLD	LUFKIN	BREED WITH	438	
438	9818	M	16	HOLD	LUFKIN	BREED WITH	415	
574	9817	M	16	HOLD	LUFKIN	BREED WITH	765	
765	10124	F	3	HOLD	LUFKIN	BREED WITH	574	

LVZOO

Lehigh Valley Zoo
Schnecksville, PA

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
35	LV0066	F	29	HOLD	LVZOO	DO NOT BREED		Excluded - 100% Unknown Pedigree
37	LV0067	M	27	HOLD	LVZOO	DO NOT BREED		Excluded - 100% Unknown Pedigree
805	LV0190	U	0	HOLD	LVZOO	DO NOT BREED		Excluded - 100% Unknown Pedigree

MEMPHIS

Memphis Zoological Garden & Aquarium
Memphis, TN

Note: Please contact the SSP Coordinator after each successful clutch.

This pair is genetically mismatched (male is over-represented); they will likely be recommended for repairing in the future.

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
27	4884	F	0	HOLD	MEMPHIS	BREED WITH	712	Potential Founder
712	22409	M	6	HOLD	MEMPHIS	BREED WITH	27	

METROZOO

Zoo Miami
Miami, FL

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
314	A02844	M	25	HOLD	METROZOO	DO NOT BREED		Excluded - 100% Unknown Pedigree
543	B10079	F	16	HOLD	METROZOO	DO NOT BREED		Excluded - 100% Unknown Pedigree

MINOT

Roosevelt Park Zoo
Minot, ND

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
487	A236	F	12	HOLD	MINOT	DO NOT BREED		
736	A319	M	4	HOLD	MINOT	DO NOT BREED		

OMAHA

Omaha's Henry Doorly Zoo
Omaha, NE

Note: Please contact the SSP Coordinator after each successful clutch.

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
311	2443	F	26	RECEIVE FROM	BROWNSVIL	BREED WITH	22, 451	Create pairings between these individuals as institution sees fit.
22	4139	M	32	HOLD	OMAHA	BREED WITH	360, 311	
451	9624	M	14	HOLD	OMAHA	BREED WITH	360, 311	
360	204635	F	19	RECEIVE FROM	PHILADELP	BREED WITH	22, 451	
452	9630	F	14	SEND TO	ALEXANDRI	BREED WITH	179	

PHILADELP

The Philadelphia Zoo
Philadelphia, PA

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
261	203172	M	31	SEND TO	BIRMINGHM	BREED WITH	172	
360	204635	F	19	SEND TO	OMAHA	BREED WITH	22, 451	

PROVIDNCE

Roger Williams Park Zoo
Providence, RI

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
699	200143	F	8	HOLD	PROVIDNCE	DO NOT BREED		
701	200136	M	8	HOLD	PROVIDNCE	DO NOT BREED		Excluded - 100% Unknown Pedigree

PUEBLA

Africam Safari
Puebla, Puebla

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
659	2522	M	18	HOLD	PUEBLA	DO NOT BREED		

SAN ANTON

San Antonio Zoological Gardens & Aqua
San Antonio, TX

Note: Please contact the SSP Coordinator after each successful clutch.

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
247	J06002	M	34	HOLD	SAN ANTON	DO NOT BREED		
345	950339	F	21	HOLD	SAN ANTON	DO NOT BREED		
746	S07046	F	4	HOLD	SAN ANTON	DO NOT BREED		
692	S09010	M	9	HOLD	SAN ANTON	BREED WITH	795	
795	809252	F	2	RECEIVE FROM	SD-WAP	BREED WITH	692	
799	L10086	F	1	SEND TO	DENVER	DO NOT BREED		

Black Crowned Crane – 2011

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*This Animal Program is currently a Yellow SSP and recommendations proposed are non-binding – Participation is voluntary.
Dispositions to non-AZA institutions should comply with each institution's acquisition/disposition policy.*

SAN FRAN

San Francisco Zoological Gardens
San Francisco, CA

Note: Please contact the SSP Coordinator after each successful clutch.

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
255	28137	F	33	HOLD	SAN FRAN	BREED WITH	256	
256	28138	M	33	HOLD	SAN FRAN	BREED WITH	255	
806	209035	F	2	HOLD	SAN FRAN	DO NOT BREED		

SD-WAP

San Diego Zoo Safari Park
Escondido, CA

Note: Please contact the SSP Coordinator after each successful clutch.

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
339	890230	M	22	HOLD	SD-WAP	BREED WITH	340	
340	890232	F	22	HOLD	SD-WAP	BREED WITH	339	
690	809226	F	9	HOLD	SD-WAP	BREED WITH	802, 763	Females 690 and 708 may breed with either male.
763	808229	M	3	HOLD	SD-WAP	BREED WITH	690, 708	
708	809227	F	7	HOLD	SD-WAP	BREED WITH	802, 763	
802	810257	M	1	HOLD	SD-WAP	BREED WITH	690, 708	
795	809252	F	2	SEND TO	SAN ANTON	BREED WITH	692	
729	807023	M	5	SEND TO	BARABOO	DO NOT BREED		Excluded - 100% Unknown Pedigree
809	811183	F	0	SEND TO	BATTLE CR	DO NOT BREED		

SEDGWICK

Sedgwick County Zoo
Wichita, KS

Note: Please contact the SSP Coordinator after each successful clutch.

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
486	10407	F	12	HOLD	SEDGWICK	BREED WITH	768	
768	12716	M	3	HOLD	SEDGWICK	BREED WITH	486	

SOUTHBEND

Potawatomi Zoo
South Bend, IN

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
325	22113	M	10	HOLD	SOUTHBEND	DO NOT BREED		Excluded - 100% Unknown Pedigree
442	99143	F	15	HOLD	SOUTHBEND	DO NOT BREED		

ST AUGUST**St. Augustine Alligator Farm**

St Augustine, FL

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
706	A0516	M	7	HOLD	ST AUGUST	DO NOT BREED		Excluded - 100% Unknown Pedigree
761	A0804	F	4	HOLD	ST AUGUST	DO NOT BREED		

ST PAUL**St. Paul's Como Zoo**

St Paul, MN

Please contact the SSP Coordinator after each successful clutch.

Note: Both of these individuals are potential founders and all efforts should be made to encourage breeding. Please contact the SSP Coordinator with any questions.

ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
398	2216	M	43	HOLD	ST PAUL	BREED WITH	704	Potential Founder
704	2779	F	19	HOLD	ST PAUL	BREED WITH	398	Potential Founder

Appendix A Pedigree Assumptions

HYPOTHETICAL SPECIMENS

Studbook ID	Sire	Dam	Sex	First Location	Notes
HYP1	32	773		UNKNOWN	32 and 773 were the only potential dams at BUSCH TAM when hatched offspring 261 hatched.

ANALYTICAL DATA FOR TRUE SPECIMENS

Studbook ID	Field	True	Overlay	Notes
17	Dam	UNK	WILD	Individual came into the population prior to 1980, when imports were still consistent, to a possible private institution. Only one other animal in the studbook is recorded as being at this institution, an UNK male that was brought in on the same date. Assume they were brought in as a wild caught pair.
	Sire	UNK	WILD	
18	Dam	UNK	WILD	Individual came into the population prior to 1980, when imports were still consistent, to a possible private institution. Only one other animal in the studbook is recorded as being at this institution, an UNK female that was brought in on the same date. Assume they were brought in as a wild caught pair.
	Sire	UNK	WILD	
189	Dam	UNK	WILD	Individual came into the population prior to 1980, when imports were still consistent, to what is assumed to be a private institution (ANIMALES). Only one other animal in the studbook is recorded as being at this institution, an UNK male that was brought in on the same date. Assume they were brought in as a wild caught pair.
	Sire	UNK	WILD	
190	Dam	UNK	WILD	Individual came into the population prior to 1980, when imports were still consistent, to what is assumed to be a private institution (ANIMALES). Only one other animal in the studbook is recorded as being at this institution, an UNK female that was brought in on the same date. Assume they were brought in as a wild caught pair.
	Sire	UNK	WILD	
22	Dam	UNK	WILD	NORTHLAND received 22 and 23 animals at the same time, possibly as a wild caught breeding pair. There was a wild caught animal recorded as being brought into the same institution that went to Philly after 22 and 23 were already in the population. Assume wild hatched.
	Sire	UNK	WILD	
23	Dam	UNK	WILD	NORTHLAND received 22 and 23 animals at the same time, possibly as a wild caught breeding pair. There was a wild caught animal recorded as being brought into the same institution that went to Philly after 22 and 23 were already in the population. Assume wild hatched.
	Sire	UNK	WILD	
261	Dam	UNK	HYP1	HYP1 represents the only 2 potential dams at BUSCH TAM at time of hatch (32 and 773). Only potential sire at BUSCH Tam at time of hatch was 773.
	Sire	UNK	737	
27	Dam	UNK	WILD	The majority of animals coming into CHATFIELD were wild caught at the time, in addition the time period this animal was brought in supports the assumption that this animal was wild hatched.
	Sire	UNK	WILD	
32	Dam	UNK	WILD	Came into the population during 1975 from IAE OH/FERNDALE with a large shipment of wild caught birds.
	Sire	UNK	WILD	
438	Dam	UNK	200	According to SCOT NECK this individual is from pairing 198 and 200.
	Sire	UNK	198	
458	Dam	UNK	200	According to SCOT NECK this individual is from pairing 198 and 200.
	Sire	UNK	198	
462	Dam	UNK	200	According to SCOT NECK this individual is from pairing 198 and 200.
	Sire	UNK	198	
487	Dam	420	WILD	ROERS BRD is a known dealer of bird species and it is assumed that they did not breed this species. Assume Wild import.
	Sire	314	WILD	
496	Dam	UNK	WILD	ROERS BRD is a known dealer of bird species and it is assumed that he did not breed this species. Assume Wild import.
	Sire	UNK	WILD	
509	Dam	UNK	WILD	BRANDENTON represents Frank Thompson, a well known dealer of birds from the 70s and 80s (as per Alan Shoemaker). It is assumed that he never breed birds, assume all are wild imports.
	Sire	UNK	WILD	

Studbook ID	Field	True	Overlay	Notes
513	Dam	UNK	WILD	Due to location and timeframe, these birds are assumed wild caught. According to studbook, it does not look as though SILVER SP was breeding this species at the time these animals were at this institution.
	Sire	UNK	WILD	
517	Dam	UNK	WILD	Due to location and timeframe, these birds are assumed wild caught. According to studbook, it does not look as though SILVER SP was breeding this species at the time these animals were at this institution.
	Sire	UNK	WILD	
535	Dam	UNK	WILD	ROERS BRD is a known dealer of bird species and it is assumed that he did not breed this species. Assume Wild import.
	Sire	UNK	WILD	
536	Dam	UNK	WILD	ROERS BRD is a known dealer of bird species and it is assumed that he did not breed this species. Assume Wild import.
	Sire	UNK	WILD	
537	Dam	UNK	WILD	ROERS BRD is a known dealer of bird species and it is assumed that he did not breed this species. Assume Wild import.
	Sire	UNK	WILD	
574	Dam	UNK	200	According SCOT NECK this individual is from pairing 198 and 200.
	Sire	UNK	198	
737	Dam	UNK	WILD	Individual came into the population prior to 1980, when imports were still consistent, to a known importer of wild caught birds. Assume wild hatched.
	Sire	UNK	WILD	
751	Dam	UNK	200	Assume that this animal came from the prolific pair at SCOT NECK (Columbia pair) - looking into the possibility of these animals being from the Michigan pair, though this is unlikely.
	Sire	UNK	198	
773	Dam	UNK	WILD	Individual came into the population prior to 1980, when imports were still consistent, to a known importer of wild caught birds. Assume wild hatched.
	Sire	UNK	WILD	
738	Dam	UNK	WILD	TRULI FARM is thought to be a private dealer and not a breeder. Due to the estimated time that this individual was brought to this institution, it is assumed to be wild caught.
	Sire	UNK	WILD	

Appendix B Summary of Data Exports

Project: XXBCCRANE2011D
 Report compiled under Population Management 2000, version 1.213
 4:22:37 PM, 10/26/2011
 Comments:
 Date to be used for calculations: 10/26/2011

Demographic data from: C:\Users\kmarti\Documents\PopLink\PopLink Databases\BCCRANE2011D\mXXBCCRANE2011D.prn
 and C:\Users\kmarti\Documents\PopLink\PopLink Databases\BCCRANE2011D\XXBCCRANE2011D.prn

Genetic data from: C:\Users\kmarti\Documents\PopLink\PopLink Databases\BCCRANE2011D\XXBCCRANE2011D.ped

Studbook information:
 Data exported on: 10/26/2011
 Data compiled by:
 Contact info:
 Data current thru: 10/26/2011 4:14:00 PM
 Scope of data:

Demographic filter conditions:
 Association = AZA.FED During 1/1/1970 - 10/26/2011 Status = Living

Genetic filter conditions:
 Association = AZA.FED
 As of 10/26/2011
 Status = Living

Appendix C Animals Excluded from the Genetic Analysis

Studbook ID	Institution	Sex	Age	Reason for Exclusion
35	LVZOO	F	29	100% Unknown Pedigree
37	LVZOO	M	25	100% Unknown Pedigree
40	ALEXANDRI	F	0	100% Unknown Pedigree
314	METROZOO	M	25	100% Unknown Pedigree
325	SOUTHBEND	M	10	100% Unknown Pedigree
471	COLUMBUS	F	13	Education
543	METROZOO	F	16	100% Unknown Pedigree
693	BALTIMORE	F	9	Education
701	PROVIDNCE	M	8	100% Unknown Pedigree
706	ST AUGUST	M	7	100% Unknown Pedigree
717	DISNEY AK	M	6	100% Unknown Pedigree
729	SD-WAP	M	5	100% Unknown Pedigree
742	ALEXANDRI	F	0	100% Unknown Pedigree
786	DALLAS	U	2	Education
805	LVZOO	U	0	100% Unknown Pedigree

The animals at LEON were made LTF during the planning meeting. 800 was transferred to BUSCH TAM.

Appendix D Life Tables

Qx = mortality; Px = survival; Lx = cumulative survivorship; Mx = fecundity; Vx = expected future reproduction

Males

Age (x)	Qx	Px	Lx	Mx	Vx	Ex	Risk(Qx)	Risk(Mx)
0	0.380	0.620	1.000	0.000	1.235	11.965	127.800	86.000
1	0.100	0.900	0.620	0.000	1.668	15.079	87.300	82.600
2	0.070	0.930	0.558	0.000	1.793	15.400	91.700	88.800
3	0.130	0.870	0.519	0.000	1.955	15.981	94.700	87.800
4	0.050	0.950	0.451	0.000	2.117	16.513	86.600	84.500
5	0.080	0.920	0.429	0.030	2.223	16.585	80.500	76.100
6	0.050	0.950	0.395	0.040	2.306	16.680	75.700	74.100
7	0.070	0.930	0.375	0.060	2.368	16.676	74.700	71.200
8	0.060	0.940	0.349	0.080	2.426	16.769	68.800	66.900
9	0.020	0.980	0.328	0.060	2.403	16.436	64.500	64.100
10	0.050	0.950	0.321	0.050	2.385	15.994	63.500	62.800
11	0.070	0.930	0.305	0.150	2.440	15.947	62.200	59.400
12	0.060	0.940	0.284	0.060	2.406	15.989	56.600	55.300
13	0.060	0.940	0.267	0.120	2.452	15.945	55.100	53.400
14	0.060	0.940	0.251	0.100	2.438	15.899	51.300	49.900
15	0.080	0.920	0.236	0.090	2.469	16.016	48.100	45.900
16	0.050	0.950	0.217	0.230	2.502	16.070	42.000	40.800
17	0.080	0.920	0.206	0.200	2.386	16.111	39.000	37.800
18	0.070	0.930	0.189	0.260	2.322	16.340	35.800	33.900
19	0.090	0.910	0.176	0.320	2.202	16.667	33.700	32.400
20	0.030	0.970	0.160	0.240	1.970	16.693	29.000	28.500
21	0.020	0.980	0.156	0.110	1.743	16.096	27.500	27.400
22	0.040	0.960	0.152	0.270	1.654	15.561	26.000	25.300
23	0.080	0.920	0.146	0.240	1.446	15.484	25.000	23.900
24	0.020	0.980	0.135	0.190	1.249	15.267	21.600	21.100
25	0.000	1.000	0.132	0.170	1.051	14.412	20.500	20.500
26	0.050	0.950	0.132	0.090	0.888	13.756	19.800	19.400
27	0.060	0.940	0.125	0.000	0.829	13.497	17.600	16.800
28	0.000	1.000	0.118	0.040	0.841	12.896	16.500	16.500
29	0.060	0.940	0.118	0.210	0.811	12.263	17.100	16.500
30	0.060	0.940	0.111	0.180	0.628	11.982	16.300	16.200
31	0.210	0.790	0.104	0.190	0.508	12.662	14.300	12.400
32	0.100	0.900	0.082	0.170	0.372	13.908	10.100	10.000
33	0.250	0.750	0.074	0.240	0.240	15.571	8.100	7.400
34	0.000	1.000	0.056	0.000	0.000	17.000	4.600	4.600
35	0.000	1.000	0.056	0.000	0.000	16.000	4.500	4.500
36	0.000	1.000	0.056	0.000	0.000	15.000	4.500	4.500
37	0.000	1.000	0.056	0.000	0.000	14.000	4.500	4.500
38	0.000	1.000	0.056	0.000	0.000	13.000	4.500	4.500
39	0.000	1.000	0.056	0.000	0.000	12.000	4.500	4.500
40	0.000	1.000	0.056	0.000	0.000	11.000	4.400	4.400
41	0.000	1.000	0.056	0.000	0.000	10.000	3.500	3.500
42	0.000	1.000	0.056	0.000	0.000	9.000	3.000	3.000
43	0.000	1.000	0.056	0.000	0.000	8.000	2.000	2.000
44	0.000	1.000	0.056	0.000	0.000	7.000	2.000	2.000
45	0.500	0.500	0.056	0.000	0.000	8.000	2.000	1.500
46	0.000	1.000	0.028	0.000	0.000	10.500	1.000	1.000
47	0.000	1.000	0.028	0.000	0.000	9.500	1.000	1.000
48	0.000	1.000	0.028	0.000	0.000	8.500	1.000	1.000
49	0.000	1.000	0.028	0.000	0.000	7.500	1.000	1.000
50	0.000	1.000	0.028	0.000	0.000	6.500	1.000	1.000
51	0.000	1.000	0.028	0.000	0.000	5.500	1.000	1.000
52	0.000	1.000	0.028	0.000	0.000	4.500	1.000	1.000
53	0.000	1.000	0.028	0.000	0.000	3.500	1.000	1.000
54	0.000	1.000	0.028	0.000	0.000	2.500	1.000	1.000
55	0.000	1.000	0.028	0.000	0.000	1.500	1.000	1.000
56	1.000	0.000	0.028	0.000	0.000	1.000	1.000	0.500

r = -0.0177, lambda = 0.9825, T=19.70, N = 44.00

Females

Age (x)	Qx	Px	lx	Mx	Vx	Ex	Risk(Qx)	Risk(Mx)
0	0.310	0.690	1.000	0.000	1.183	11.944	136.600	100.000
1	0.090	0.910	0.690	0.000	1.481	14.034	101.800	98.600
2	0.100	0.900	0.628	0.000	1.596	14.398	109.700	104.400
3	0.110	0.890	0.565	0.000	1.739	14.966	112.400	105.200
4	0.030	0.970	0.503	0.030	1.829	15.054	105.900	103.800
5	0.070	0.930	0.488	0.050	1.848	14.789	103.900	99.200
6	0.040	0.960	0.454	0.020	1.857	14.600	98.600	96.000
7	0.040	0.960	0.436	0.060	1.867	14.167	96.700	94.300
8	0.060	0.940	0.418	0.030	1.856	13.857	89.100	87.700
9	0.040	0.960	0.393	0.050	1.876	13.538	84.800	82.500
10	0.070	0.930	0.377	0.120	1.884	13.264	85.900	81.900
11	0.040	0.960	0.351	0.130	1.823	12.985	81.400	80.400
12	0.080	0.920	0.337	0.040	1.756	12.744	78.500	75.400
13	0.060	0.940	0.310	0.150	1.801	12.634	70.500	69.800
14	0.020	0.980	0.291	0.110	1.680	12.127	63.300	63.000
15	0.070	0.930	0.286	0.060	1.603	11.648	60.500	58.600
16	0.040	0.960	0.266	0.140	1.594	11.274	54.200	53.900
17	0.140	0.860	0.255	0.190	1.557	11.277	50.900	47.100
18	0.120	0.880	0.219	0.180	1.535	11.823	44.300	40.500
19	0.030	0.970	0.193	0.210	1.434	11.737	36.000	35.800
20	0.090	0.910	0.187	0.090	1.270	11.417	33.100	30.600
21	0.020	0.980	0.170	0.220	1.220	11.043	28.600	28.400
22	0.030	0.970	0.167	0.220	1.001	10.300	28.900	27.900
23	0.110	0.890	0.162	0.160	0.818	9.993	27.000	25.500
24	0.110	0.890	0.144	0.260	0.722	10.105	23.500	22.100
25	0.000	1.000	0.128	0.060	0.479	9.667	20.500	20.500
26	0.050	0.950	0.128	0.090	0.419	8.890	20.000	19.600
27	0.000	1.000	0.122	0.060	0.329	8.097	18.500	18.500
28	0.000	1.000	0.122	0.030	0.263	7.097	18.500	18.500
29	0.060	0.940	0.122	0.100	0.234	6.286	17.400	17.000
30	0.060	0.940	0.114	0.080	0.139	5.623	15.500	15.100
31	0.210	0.790	0.108	0.000	0.067	5.330	14.000	12.400
32	0.300	0.700	0.085	0.000	0.087	5.772	10.100	8.300
33	0.000	1.000	0.060	0.000	0.103	5.794	6.300	6.300
34	0.180	0.820	0.060	0.110	0.110	5.269	5.500	5.300
35	0.000	1.000	0.049	0.000	0.000	4.737	4.500	4.500
36	0.220	0.780	0.049	0.000	0.000	4.199	4.500	3.500
37	0.000	1.000	0.038	0.000	0.000	3.650	3.500	3.500
38	0.570	0.430	0.038	0.000	0.000	3.706	3.500	2.900
39	0.000	1.000	0.016	0.000	0.000	4.500	1.500	1.500
40	0.000	1.000	0.016	0.000	0.000	3.500	1.500	1.500
41	0.000	1.000	0.016	0.000	0.000	2.500	1.100	1.100
42	0.000	1.000	0.016	0.000	0.000	1.500	0.200	0.200
43	1.000	0.000	0.016	0.000	0.000	1.000	0.000	0.000
44	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
45	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
46	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
47	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
48	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
49	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
50	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
51	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
52	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
53	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
54	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
55	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
56	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

r = -0.0246, lambda = 0.9757, T=17.95, N = 47.00

Appendix E Ordered Mean Kinship

Note: These lists are current to October 2011 and values are subject to change with any hatch, death, import, export, inclusion, exclusion, or changes in pedigree or pedigree assumptions. Unknown sexed animals show on both lists.

Population MK = 0.0371

Males

Females

<u>ID</u>	<u>MK</u>	<u>%known</u>	<u>Age</u>	<u>Location</u>	<u>ID</u>	<u>MK</u>	<u>%known</u>	<u>Age</u>	<u>Location</u>
455	0.000	100.0	0	BOISE	454	0.000	100.0	0	BOISE
398	0.000	100.0	43	ST PAUL	311	0.000	100.0	27	BROWNSVIL
179	0.004	100.0	41	ALEXANDRI	27	0.000	100.0	0	MEMPHIS
22	0.009	100.0	32	OMAHA	704	0.000	100.0	19	ST PAUL
659	0.009	100.0	18	PUEBLA	762	0.009	50.0	18	ALEXANDRI
451	0.013	100.0	15	OMAHA	452	0.013	100.0	15	OMAHA
261	0.018	100.0	31	PHILADELP	172	0.022	100.0	42	BIRMINGHM
18	0.022	100.0	34	LOSANGELE	360	0.022	50.0	19	PHILADELP
256	0.022	100.0	33	SAN FRAN	255	0.022	100.0	33	SAN FRAN
410	0.027	100.0	26	AUDUBON	530	0.024	100.0	14	BUSCH TAM
749	0.027	100.0	8	BALTIMORE	750	0.027	100.0	8	BALTIMORE
352	0.027	100.0	20	HOUSTON	791	0.027	100.0	2	COLUMBUS
692	0.027	100.0	9	SAN ANTON	806	0.027	100.0	2	SAN FRAN
247	0.031	100.0	34	SAN ANTON	690	0.027	100.0	9	SD-WAP
339	0.031	100.0	22	SD-WAP	708	0.027	100.0	7	SD-WAP
460	0.034	100.0	14	BARABOO	442	0.027	100.0	15	SOUTHBEND
494	0.034	100.0	9	BREVARD	340	0.031	100.0	22	SD-WAP
485	0.036	50.0	12	CHEHAW	465	0.036	50.0	14	BARABOO
763	0.036	100.0	3	SD-WAP	694	0.036	100.0	8	BREVARD
802	0.036	100.0	1	SD-WAP	720	0.036	100.0	6	DALLAS
51	0.038	100.0	22	BROWNSVIL	487	0.036	50.0	12	MINOT
476	0.040	100.0	12	DISNEY AK	699	0.036	100.0	8	PROVIDNCE
751	0.040	100.0	6	DREHER PA	795	0.036	100.0	2	SD-WAP
438	0.040	100.0	16	LUFKIN	809	0.036	100.0	0	SD-WAP
574	0.040	100.0	16	LUFKIN	486	0.036	50.0	12	SEDGWICK
769	0.042	100.0	3	BUSCH TAM	346	0.038	100.0	20	BALTIMORE
712	0.042	100.0	6	MEMPHIS	415	0.038	100.0	19	LUFKIN
768	0.042	100.0	3	SEDGWICK	462	0.040	100.0	14	DISNEY AK
735	0.047	100.0	4	BALTIMORE	796	0.042	100.0	1	AUDUBON
736	0.047	100.0	4	MINOT	797	0.042	100.0	1	AUDUBON
726	0.047	100.0	5	OKLAHOMA	687	0.042	100.0	7	BUSCH TAM
800	0.047	100.0	1	SAN ANTON	765	0.047	100.0	3	LUFKIN
739	0.051	100.0	4	BIRMINGHM	746	0.047	100.0	4	SAN ANTON
771	0.051	100.0	3	COLUMBUS	799	0.047	100.0	1	SAN ANTON
785	0.051	100.0	2	DENVER	474	0.048	100.0	12	AUDUBON
					741	0.051	100.0	4	BIRMINGHM
					730	0.051	100.0	5	BUSCH TAM
					761	0.051	100.0	4	ST AUGUST
					458	0.054	100.0	14	DISNEY AK
					345	0.054	100.0	21	SAN ANTON

Appendix F

SSP Coordinator Black Crowned Crane Husbandry Survey

In early 2011 a survey was sent out to all Black Crowned Crane holders requesting some basic information on crane husbandry at their facility. As program leader, I am asked most often about diet and what other animal species can share exhibit space. Below are summarized results of those two questions. Keep in mind that I did not receive specifics on whether multi-species exhibits had experienced difficulty, so the combinations listed might not always be successful.

Diet

Most institutions are using Mazuri crane, either ad lib or in a measured amount. Other feeds being used are Ziegler crane diet, layena, chicken scratch, Purina duck chow, gamebird and high protein dog food. In addition to the dry food, a large variety of fresher foods are used as dietary supplements or enrichment/training foods. These are: superworms, mealworms, crickets, raw cabbage, sweet potato, corn, whole wheat, peanuts, seed mix, apples, corn, peas, cooked carrots, hopper and pinkie sized mice, hard-boiled egg, kale, endive, spinach, lettuce, crushed oyster, grapes, avian plus vitamins, silverside fish and cracked corn. If you would like more information about any of the above diet combinations, please feel free to contact me (Reisse@countyofdane.com).

Multi-species Exhibits

A number of institutions are keeping their cranes in exhibits with other bird, mammal and reptile species – these are the pairing reported in the survey. Note that all institutions that responded keep their cranes alone, in pairs, or in family groups.

1.1 cranes housed with a pair of Plush-capped Jays

0.2 cranes housed with 2.1 Abdim Stork, 1.0 Demoiselle Crane, 1.0 Red Flanked Duiker

1.1 cranes housed with 1.0 Egyptian Goose

1.1 cranes housed with 3.0 Lesser Kudu and 1.1 Grant's Zebras and 0.1 Yellow-billed Stork

1.0 crane with Yellow-flanked Duikers and Bongo

1.1 cranes with 3.3 Sacred Ibis and 0.1 Spur-thighed Tortoise.

1.1 cranes with 1.1 Lappet Faced Vultures, 2.0 White Storks, 2.2 Red Kangaroos, and assorted waterfowl

1.1 cranes with 1.1 Klipspringer, 1.1 Ground Hornbill, 2.0 Marabou Storks

1.1 cranes (father/daughter) with 1.0 Secretary Bird, 1.1 Saddle-bill Storks and spend part of the day out with Mhorrs Gazelle

1.1.2 cranes with 1.1 Kori Bustard and 5.0 Giraffe

1.1 cranes with 1.1 Bay Duikers and free roaming waterfowl

1.0 crane with 1.0 Gerenuk, 1.1 Abyssinian Ground Hornbill

1.1 cranes with 4.0 Carmine Bee-eaters, 1.0 Racquet Tailed Roller, 0.2 White Crowned Robin Chats, 0.1 African Golden Oriole, 2.0 Emerald Starlings, 0.1 Hamerkop, 1.1 Sacred Ibis, 2.2 Violet Backed Starlings, 1.0 African Black Crane, 1.0 Blue Bellied Roller, 0.0.4 Cattle Egrets, 1.1 Hottentot Teals, 1.4 Speckled Pigeons, 0.1 Common Bulbul, 1.0 East African Crowned Crane

1.0 crane had previously displayed with 2 Okapi, 2 Yellow-backed Duikers, 3 Sulcata Tortoises: previous mate was run over by spooked Okapi

1.1 cranes with 2.0 Ankole Steers

1.0 crane with 0.3 White-tailed Deer, 0.0.5 Gopher Tortoises, 0.2 Florida Sandhill Cranes

1.1 cranes with 0.2 Bongo, 2.1 free range Peafowl, free range Mallards

1.1 cranes with Yellow-backed Duikers, Bongo, Rhino, and a single bird lives in the large free flight covered aviary with other large birds (ibis, flamingo, swan, storks etc)

1.0 crane with deer, tortoises and Sandhill Cranes

1.1 cranes with waterfowl, mallards, wood ducks, common pintails. Will not accept larger birds like magpie geese.

1.1 cranes with 3 Dik Dik or 2 ostrich, 5 Bongo and 5 gazelle

1.1 cranes with 3.2 Cape Griffon Vulture, 3.3 Hooded Vulture, 2.0 Marabou Stork

1.1, 1.1 and 1.2 all kept with multiple bird and mammal species

1.1 cranes with 0.2 Sitatunga

1.1 cranes with 1.1 Secretary Birds

1.1 cranes with 0.1 or 0.2 Okapi

Appendix G

Definitions

Management Terms

Green Species Survival Plan® (Green SSP) Program – A Green SSP Program has a population size of 50 or more animals and is projected to retain 90% gene diversity for a minimum of 100 years or 10 generations. Green SSP Programs are subject to AZA's Full Participation and Non-Member Participation Policies.

Yellow Species Survival Plan® (Yellow SSP) Program – A Yellow SSP Program has a population size of 50 or more animals but cannot retain 90% gene diversity for 100 years or 10 generations. Yellow SSP participation by AZA institutions is voluntary.

Red Program – A Red Program has a population size of fewer than 50 animals. If the Taxon Advisory Group (TAG) recommends this species in their Regional Collection Plan (RCP), a Red Program will have an official AZA Regional Studbook but will not be required to produce a formal Breeding and Transfer Plan on a regular basis. Red Program participation by AZA institutions is voluntary.

Full Participation – AZA policy stating that all AZA accredited institutions and certified related facilities having a Green SSP animal in their collection are required to participate in the collaborative SSP planning process (e.g., provide relevant animal data to the AZA Studbook Keeper, assign an Institutional Representative who will communicate institutional wants and needs to the SSP Coordinator and comment on the draft plan during the 30-day review period, and abide by the recommendations agreed upon in the final plan).

All AZA member institutions and Animal Programs, regardless of management designation, must adhere to the AZA Acquisition and Disposition Policy, and well as the AZA Code of Professional Ethics. For more information on AZA policies, see <http://www.aza.org/board-policies/>.

Demographic Terms

Age Distribution – A two-way classification showing the numbers or percentages of individuals in various age and sex classes.

Ex, Life Expectancy – Average years of further life for an animal in age class x.

Lambda (λ) or Population Growth Rate – The proportional change in population size from one year to the next. Lambda can be based on life-table calculations (the expected lambda) or from observed changes in population size from year to year. A lambda of 1.11 means an 11% per year increase; lambda of .97 means a 3% decline in size per year.

lx, Age-Specific Survivorship – The probability that a new individual (e.g., age 0) is alive at the *beginning* of age x. Alternatively, the proportion of individuals which survive from birth to the beginning of a specific age class.

Mx, Fecundity – The average number of same-sexed young born to animals in that age class. Because SPARKS is typically using relatively small sample sizes, SPARKS calculates Mx as 1/2 the average number of young born to animals in that age class. This provides a somewhat less "noisy" estimate of Mx, though it does not allow for unusual sex ratios. The fecundity rates provide information on the age of first, last, and maximum reproduction.

Px, Age-Specific Survival – The probability that an individual of age x survives one time period; is conditional on an individual being alive at the beginning of the time period. Alternatively, the proportion of individuals which survive from the beginning of one age class to the next.

Qx, Mortality – Probability that an individual of age x dies during time period. $Qx = 1 - Px$

Risk (Qx or Mx) – The number of individuals that have lived during an age class. The number at risk is used to calculate Mx and Qx by dividing the number of births and deaths that occurred during an age class by the number of animals at risk of dying and reproducing during that age class. The proportion of individuals that die during an age class. It is calculated from the number of animals that die during an age class divided by the number of animals that were alive at the beginning of the age class (i.e. "at risk").

Vx, Reproductive Value – The expected number of offspring produced this year and in future years by an animal of age x.

Genetic Terms

Allele Retention – The probability that a gene present in a founder individual exists in the living, descendant population.

Current Gene Diversity (GD) -- The proportional gene diversity (as a proportion of the source population) is the probability that two alleles from the same locus sampled at random from the population will not be identical by descent. Gene diversity is calculated from allele frequencies, and is the heterozygosity expected in progeny produced by random mating, and if the population were in Hardy-Weinberg equilibrium.

Effective Population Size (Inbreeding N_e) -- The size of a randomly mating population of constant size with equal sex ratio and a Poisson distribution of family sizes that would (a) result in the same mean rate of inbreeding as that observed in the population, or (b) would result in the same rate of random change in gene frequencies (genetic drift) as observed in the population. These two definitions are identical only if the population is demographically stable (because the rate of inbreeding depends on the distribution of alleles in the parental generation, whereas the rate of gene frequency drift is measured in the current generation).

FOKE, First Order Kin Equivalents – The number of first-order kin (siblings or offspring) that would contain the number of copies of an individual's alleles (identical by descent) as are present in the captive-born population. Thus an offspring or sib contributes 1 to FOKE; each grand-offspring contributes 1/2 to FOKE; each cousin contributes 1/4 to FOKE. $FOKE = 4 * N * MK$, in which N is the number of living animals in the captive population.

Founder – An individual obtained from a source population (often the wild) that has no known relationship to any individuals in the derived population (except for its own descendants).

Founder Contribution -- Number of copies of a founder's genome that are present in the living descendants. Each offspring contributes 0.5, each grand-offspring contributes 0.25, etc.

Founder Genome Equivalents (FGE) – The number wild-caught individuals (founders) that would produce the same amount of gene diversity as does the population under study. The gene diversity of a population is $1 - 1 / (2 * FGE)$.

Founder Genome Surviving – The sum of allelic retentions of the individual founders (i.e., the product of the mean allelic retention and the number of founders).

Founder Representation -- Proportion of the genes in the living, descendant population that are derived from that founder. I.e., proportional Founder Contribution.

GU, Genome Uniqueness – Probability that an allele sampled at random from an individual is not present, identical by descent, in any other living individual in the population. GU-all is the genome uniqueness relative to the entire population. GU-Desc is the genome uniqueness relative to the living non-founder, descendants.

Inbreeding Coefficient (F) -- Probability that the two alleles at a genetic locus are identical by descent from an ancestor common to both parents. The mean inbreeding coefficient of a population will be the proportional decrease in observed heterozygosity relative to the expected heterozygosity of the founder population.

Kinship Value (KV) – The weighted mean kinship of an animal, with the weights being the reproductive values of each of the kin. The mean kinship value of a population predicts the loss of gene diversity expected in the subsequent generation if all animals were to mate randomly and all were to produce the numbers of offspring expected for animals of their age.

Mean Generation Time (T) – The average time elapsing from reproduction in one generation to the time the next generation reproduces. Also, the average age at which a female (or male) produces offspring. It is not the age of first reproduction. Males and females often have different generation times.

Mean Kinship (MK) – The mean kinship coefficient between an animal and all animals (including itself) in the living, captive-born population. The mean kinship of a population is equal to the proportional loss of gene diversity of the descendant (captive-born) population relative to the founders and is also the mean inbreeding coefficient of progeny produced by random mating. Mean kinship is also the reciprocal of two times the founder genome equivalents: $MK = 1 / (2 * FGE)$. $MK = 1 - GD$.

Percent Known – Percent of an animal's genome that is traceable to known Founders. Thus, if an animal has an UNK sire, the % Known = 50. If it has an UNK grandparent, % Known = 75.

Prob Lost – Probability that a random allele from the individual will be lost from the population in the next generation, because neither this individual nor any of its relatives pass on the allele to an offspring. Assumes that each individual will produce a number of future offspring equal to its reproductive value, V_x .

Appendix H

Directory of Institutional Representatives

Contact Name (IR)	Institution	Email
Carla Oncay	ALEXANDRI - Alexandria Zoological Park, Alexandria, LA	carla.oncay@cityofalex.com
Rick Dietz	AUDUBON - Audubon Zoo, New Orleans, LA	rdietz@auduboninstitute.org
Don Hutchinson	BALTIMORE - The Maryland Zoo in Baltimore, Baltimore, MD	don.hutchinson@marylandzoo.org
Bryant Tarr	BARABOO - International Crane Foundation, Baraboo, WI	btarr@savingcranes.org
Jenny Barnett	BATTLE CR - Binder Park Zoo, Battle Creek, MI	jbarnett@binderparkzoo.org
Cindy Pinger	BIRMINGHAM - Birmingham Zoo, Birmingham, AL	cpinger@birminghamzoo.com
Steve Burns	BOISE - Zoo Boise, Boise, ID	sburns@cityofboise.org
Michelle Smurl	BREVARD - Brevard Zoo, Melbourne, FL	msmurl@brevardzoo.org
Colette Adams	BROWNSVIL - Gladys Porter Zoo, Brownsville, TX	cadams@gpz.org
Michael Boos	BUSCH TAM - Busch Gardens, Tampa, FL	michael.boos@buschgardens.com
Ben Roberts	CHEHAW - Chehaw Wild Animal Park, Albany, GA	BRoberts@chehaw.org
Dusty Lombardi	COLUMBUS - Columbus Zoo and Aquarium, Powell, OH	dusty.lombardi@columbuszoo.org
Chuck Siegel	DALLAS - Dallas Zoo, Dallas, TX	charles.siegel@dallaszoo.com
John Azua	DENVER - Denver Zoological Gardens, Denver, CO	jazua@denverzoo.org
Chelle Plasse	DISNEY AK - Disneys Animal Kingdom/The Living Seas, Bay Lake, FL	chelle.plasse@disney.com
Keith Lovett	DREHER PA - Palm Beach Zoo at Dreher Park, West Palm Beach, FL	k.lovett@lycos.com
Liliana Abascal	GUADALJR-Guadalajara Zoo, Mexico	labascal@zooguadalajara.com.mx
Hannah Bailey	HOUSTON - Houston Zoo, Inc., Houston, TX	hbailey@houstonzoo.org
Everett Harris	IAE OH - IAE - African Safari Wildlife Park, Port Clinton, OH	eharrisaswp@aol.com
Robyn Barfoot	ISSAQUAH-Cougar Mountain Zoological Park	CougarMZoo@aol.com
John Lewis	LOSANGELE - Los Angeles Zoo & Botanical Gardens, Los Angeles, CA	john.lewis@lacity.org
Celia Falzone	LUFKIN - Ellen Trout Zoo, Lufkin, TX	cfalzone@ellentroutzoo.com
Anthony LaPorte	LVZOO - Lehigh Valley Zoo, Schnecksville, PA	tlaporte@lvzoo.org
Carol Hesch	MEMPHIS - Memphis Zoological Garden & Aquarium, Memphis, TN	chesch@memphiszoo.org
Jim Andelin	METRORICH - Metro Richmond Zoo, Moseley, VA	jsandelin@juno.com

Contact Name (IR)	Institution	Email
Jim Dunster	METROZOO - Zoo Miami, Miami, FL	jdun@miamidade.gov
Sarah Schoenberg	MINOT - Roosevelt Park Zoo, Minot, ND	sarahrpz@srt.com
Ken Naugher	MONTGOMRY - Montgomery Zoo, Montgomery, AL	knaugher@montgomeryal.gov
Darcy Henthorn	OKLAHOMA - Oklahoma City Zoological Park, Oklahoma City, OK	dhenthorn@okczoo.com
Stephanie Huettner	OMAHA - Omaha's Henry Doorly Zoo, Omaha, NE	registrar@omahazoo.com
Aliza Baltz	PHILADELPHIA - The Philadelphia Zoo, Philadelphia, PA	Baltz.aliza@phillyzoo.org
Tim French	PROVIDENCE - Roger Williams Park Zoo, Providence, RI	tfrench@rwpzoo.org
Frank Camacho	PUEBLA - Africam Safari, Puebla, Mexico	fcamacho@africamsafari.com.mx
Josef San Miguel	SAN ANTONIO - San Antonio Zoological Gardens & Aqua, San Antonio, TX	zooregistrar@sazoo-aq.org
Tanya Peterson	SAN FRANCISCO - San Francisco Zoological Gardens, San Francisco, CA	tanyap@sfzoo.org
Ali Lubbock	SCOT NECK - Sylvan Heights Waterfowl	ali@shwpark.com
Mike Mace	SD-WAP - San Diego Zoo Safari Park, Escondido, CA	MMace@sandiegozoo.org
Joe Barkowski	SEDGWICK - Sedgwick County Zoo, Wichita, KS	jbarkowski@scz.org
Laura Arriaga	SOUTHBEND - Potawatomi Zoo, South Bend, IN	larriaga@southbendin.gov
Gen Anderson	ST AUGUSTINE - St. Augustine Alligator Farm, St Augustine, FL	ganderson@alligatorfarm.com
Joanne Kelly	ST PAUL - St. Paul's Como Zoo, St Paul, MN	joanne.kelly@ci.stpaul.mn.us
Jack Ewert	WILD WRLD - Wildlife World Zoo, Litchfield Park, AZ	jackewert@wildlifeworld.com
Rob Bules	WORLD BIRD - Steve Martin Natural Encounters, Inc., Winter Haven, FL	r.bules@naturalencounters.com
Laura Reisse	MADISON - Henry Vilas Zoo, Madison, WI	Reisse@countyofdane.com