Population Analysis & Breeding and Transfer Plan

Spectacled Owl (*Pulsatrix perspicillata*)
AZA Species Survival Plan®
Yellow Program

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PMC Population Management Center

LINCOLN PARK ZOO.

ASSOCIATION OF ZOOS & AQUARIUMS

Executive Summary

Species Survival Plan® for the Spectacled Owl *(Pulsatrix perspicillata)*

The spectacled owl population at the time of analyses consists of 76 owls (38 males, 30 females and 8 unknown) birds distributed among 31 AZA institutions and 4 non-AZA. The Raptor Taxon Advisory Group (TAG) has designated this population as a SSP and set the target population size at 85 individuals in their 2015 Regional Collection Plan (RCP). Under AZA's new sustainability designations, this population currently qualifies as a Yellow SSP Program.

Genetic statistics are based on an analytical studbook with pedigree assumptions intended to estimate relatedness and inbreeding. The current population is descended from 15 founders with no potential founders remaining. Gene diversity in the population is estimated to be 91.35%, which is equivalent to that found in 5-6 unrelated individuals (FGE = 5.78). Under current population parameters and assuming a growth rate of 1% (λ=1.01), the population is projected to maintain 74.2% gene diversty at the end of 100 years. 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, smaller clutch sizes, and greater chick mortality.

Demography	
Current size of SSP population (N) – Total (Males.Females.Unknown Sex)	76 (38.30.8)
Number of individuals excluded from management	28 (17.7.4)
Population size following exclusions	48 (21.23.4)
Target population size (Kt) from Raptor Tag 2015 RCP	85
Mean generation time (years) (T)	10.1
Population Growth Rates (λ; lambda)*: Historical / 5 –year / Projected	1.06 / 1.014 / 1.025

*Historical from life tables (AZA 1980-present)/ 5-Year from PopLink Census/ Projected from PMx 20 year stochastic projections

Genetics	**Current**	**Potential**
Founders	15	0
Founder genome equivalents (FGE)	5.78	11.43
Gene diversity (GD %)	91.35	95.63
Population mean kinship (MK)	0.0878	-
Mean inbreeding (F)	0.0220	-
Effective population size/census size ratio (Ne / N)	0.4444	-
Percentage of pedigree known before assumptions & exclusions	96	-
Percentage of pedigree known after assumptions & exclusions	100	-
Percentage of pedigree certain after assumptions & exclusions	100	-
Projections		
Years To 90% Gene Diversity	5	-
Years to 10% Loss of Gene Diversity	56	-
Gene Diversity at 100 years from present (%)	74.2	-
Target population size (Kt – exclusions = 58) and Growth rates (λ) For Genetic Projections	λ = 1.01, Kt = 58	-

To maintain the population at its current size of 76 birds (λ = 1.00), approximately 2 hatches are needed over the coming year, and approximately 5-6 hatches are needed annually to grow to a 5-year target size of 85 birds (λ=1.018). Reaching these demographic goals appear reasonable given the average of 5 hatches annually observed over the past five years (2012 – 2016). Interest in breeding has increased some from previous reports and will help toward growth to the target size. The SSP is still seeking to import orphaned or rehabilitation animals from Trinidad to fill animal requests and introduce new founders. Facilities interested in acquiring birds should contact the SSP Coordinators. As with all SSPs, pairings are based on mean kinship, avoidance of inbreeding, avoidance of linking rare and common lineages, and logistical constraints identified by the participating institutions.

Summary Actions: The SSP recommends 13 females for breeding and 9 transfers to meet population goals and institutional requests.

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Acknowledgments

The Spectacled Owl SSP planning session was held on May 18th via internet conferencing and was attended by the following:

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

Species Survival Plan® for Spectacled Owl *(Pulsatrix perspicillata)*

Introduction:
The spectacled owl population at the time of analyses consists of 76 owls (38 males, 30 females and 8 unknown) birds distributed among 31 AZA institutions and 4 non-AZA. The Raptor Taxon Advisory Group (TAG) has designated this population as a SSP and set the target population size at 85 individuals in their 2015 Regional Collection Plan (RCP). Under AZA's new sustainability designations, this population currently qualifies as a Yellow SSP Program.

Comprehensive genetic and demographic analyses of this population were performed on 18 May 2017 resulting in the current breeding and transfer plan. Analyses of the analytical version of the Spectacled Owl Studbook (current to 28 February 2017) were performed using PopLink 2.4 and PMx 1.4.20161017. Recommendations contained in this plan supersede those made by earlier plans.

Status and Conservation:
In 2012, the IUCN listed the Spectacled Owl as "Least Concern, LC" due to its large population size across an extremely large range extending from virtually all of northern South America up through Costa Rica.

Analytical Studbook:
The population's pedigree is 96% known. Pedigree assumptions created in 2005 were modified to include new assumptions that repair misidentified parentages (Appendix A). Twenty-eight (28) owls were excluded from the potentially breeding population for reasons outlined in Appendix C. Following these assumptions and exclusions, the potentially breeding population is comprised of 48 birds (21.23.4) with 100% known pedigree.

Demography:
Spectacled Owls first appeared in North American zoos in 1906 but did not start breeding consistently until the early 1980s. By 1988, the population had exceeded 20 individuals and began outnumbering wild hatched birds. The population experienced steady growth, reaching a peak population size of 81 individuals in 2007 but has since declined slightly to its current size of 78 birds (Fig. 1). Over the past 5 years, hatches have varied from 0 to 9 annually. The population has produced an average of 5 hatches annually from 2012 – 2016 (average 5 year λ=1.014). Nevertheless, decreased institutional interest in recent years coupled with non-breeding ambassador program birds taking up limited institutional space available for breeding birds remains a demographic challenge for this population. In order to maintain current population size, 2 hatches are needed in the coming year, and about 5 to 6 hatches are needed annually in order to grow to the 5 year target size of 85 birds. The SSP should focus on maintaining consistent reproduction and consider recruiting some ambassador program birds into the potentially breeding population.

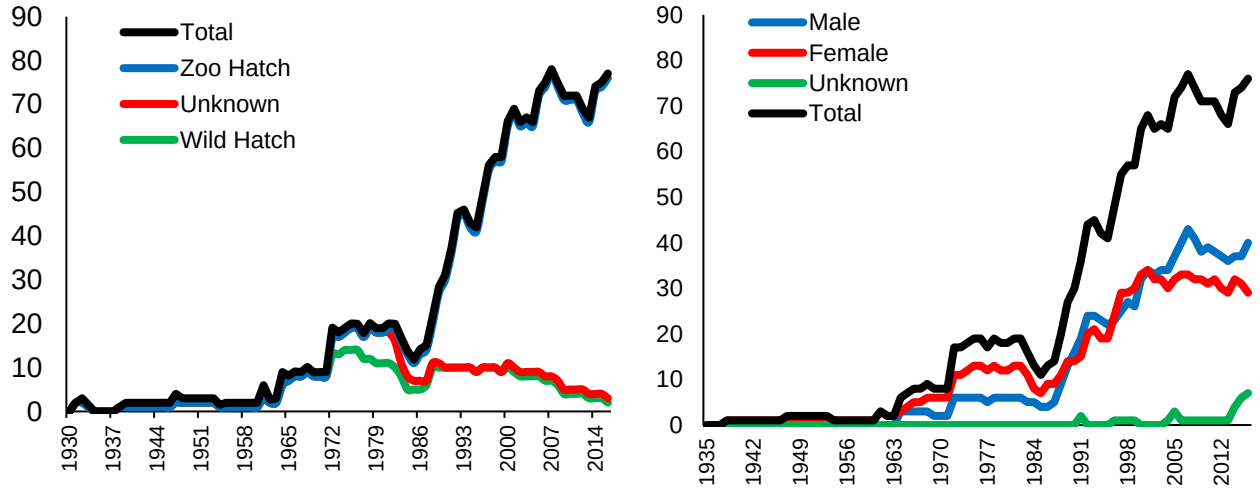


Figure 1: Census of the spectacled owl population by (left) origin and by (right) sex from 1930 to present (Data current to February 2017).

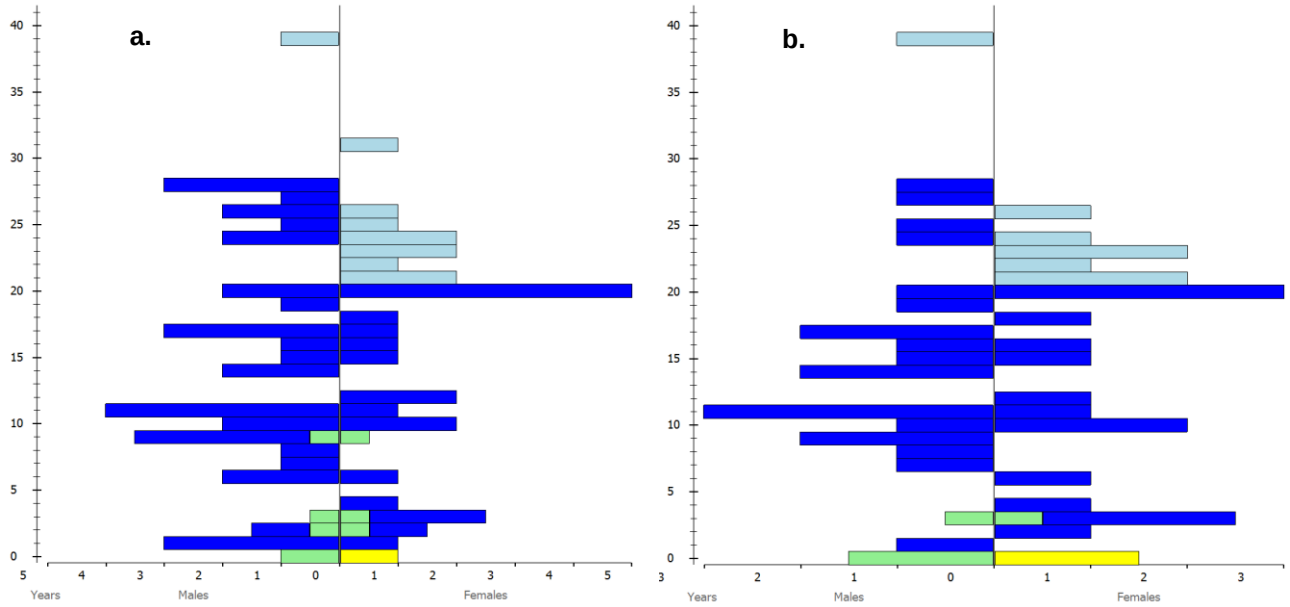


Figure 2: Age structure for the (a) total ssp population, N=76 and the (b) potentially breeding population, N=48. Note the change in scale between graphs. (Data current to February 2017).

The age structure of this population is somewhat unstable and stretched in appearance, with several gaps in younger age classes which could potentially compromise future reproduction (Fig. 2). Additionally, the removal of education animals reduces the potentially breeding population substantially and may be excluding valuable breeding individuals. Sex ratios for the potentially breeding population are equal with 1:1 males to females. Though hatches have been variable in recent years, more than half of the current population is of reproductive age. The current age structure can be improved by maintaining consistent breeding at recent rates to fill juvenile age classes, offset mortality and maintain or increase population size.

First-year mortality is low at 23% for males and 27% for females. The oldest male and female are still living at 39 and 31 years respectively with few other individuals having been recorded living past 30 in North American zoos (Appendix D). Current demographic data for this population may be lacking and not represent its true life history due to small sample sizes in older age classes. As a result, median life expectancy cannot accurately be calculated (Appendix F), and maximum lifespan in zoos is not yet clear.

Studbook data indicate that male and female spectacled owls can breed as early as one year but both generally start breeding around 2 years of age. The oldest male to reproduce was 36 years old, producing chicks as recently as 2014. The oldest female to hatch young was 20, and this is likely the maximum breeding age for females of this species according to the SSP Coordinator. Clutch size ranges from one to two eggs, with the median of one chick per clutch observed.

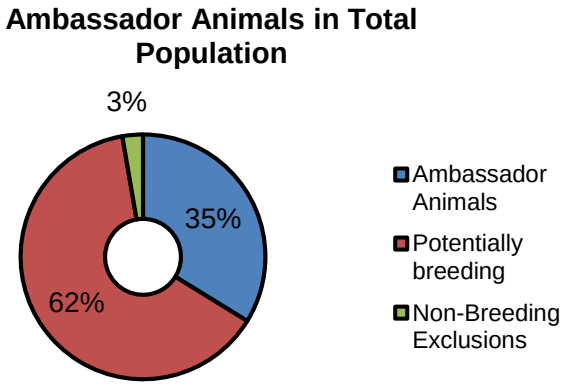


Figure 3: Graphic showing the proportion of animals identified as ambassador animals in the Spectacled Owl SSP population, N = 76 owls.

Spectacled owls are used often in ambassador programs with 35% (27/76) of the SSP population currently identified in ambassador roles (Fig. 3). Most of these birds have been excluded from the potentially breeding population at this time. With a notable portion of the population occupying space but unavailable for breeding, greater pressure is placed on a limited number of breeding pairs to maintain the entire population. The number of animals contributing genetically is also reduced and the SSP has some birds being recommended to be brought back into the breeding population based on institutional cooperation. The SSP will continue to use this strategy as needed based on genetic needs and institutional cooperation.

Genetics:
Genetic statistics are based on an analytical studbook with pedigree assumptions intended to estimate relatedness and inbreeding. After these assumptions, the spectacled owl population is descended from 15 founders with no potential founders remaining. Gene diversity in the population is currently 91.35%, equivalent to that found in 5-6 unrelated individuals (FGE = 5.78). Under current population parameters, long-term projections indicate that gene diversity will fall to 74.2% in 100 years (assuming growth rate of approximately 1% and target population size of 85) and will fall to 90% in 5 years. 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 chick mortality in some species.

Genetic Summary*

	2012	*2015*	**Current**	**Potential**
Founders	*13*	*15*	15	0
Founder genome equivalents (FGE)	*5.35*	*5.78*	5.78	11.43
Gene diversity (GD %)	*90.71*	*91.35*	91.35	95.63
Population mean kinship (MK)	*0.0929*	*0.0865*	0.0878	-
Mean inbreeding (F)	*0.0265*	*0.0230*	0.0220	-
Effective population size/census size ratio (Ne / N)	*0.3704*	*0.4831*	0.4444	-
Percentage of pedigree known before assumptions & exclusions	*96*	*96%*	96	-
Percentage of pedigree known after assumptions & exclusions	*100*	*100%*	100	-
	-	-	100	-
Projections	*Kt = 85, λ = 1.01*	*Kt = 85, λ = 1.01*	*Kt = 85, λ = 1.01*	-
Years To 90% Gene Diversity	*1*	*10*	5	-
Years to 10% Loss of Gene Diversity	*46*	*81*	56	-
Gene Diversity at 100 years from present (%)	*72.31*	*79.4*	74.2	-

*Genetic statistics may not be comparable across years due to changes in targe size, pedigree assumptions, or growth rates used for long term projections. Current estimates based on analytical studbook "SpecOwl_16May2017 + JA Tester"

Potential gene diversity is high (95.63%), and could be exploited through equalization of founder representation (Fig. 4), increased reproduction, and increased population growth, thus minimizing the loss of gene diversity. The SSP is also currently exploring the potential to import new founders from Trinidad or unrelated lineages from other regions and has set a goal of importing 4 – 6 birds for the life of this report (2017 – 2019). Any institutions interested in participating in this process are encouraged to contact the SSP coordinator for details.

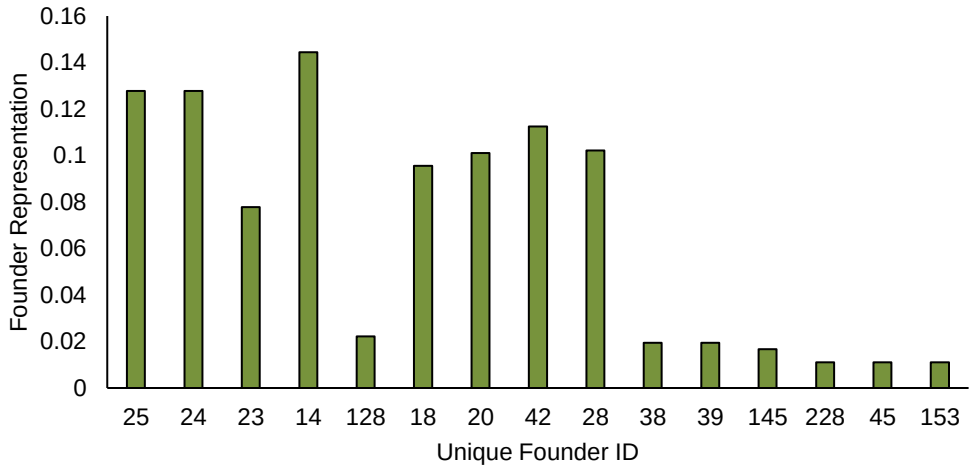


Figure 4: Founder graph showing inequality of founder representation in the spectacled owl managed population (Data current to February 2017).

Recommendations Outcomes:

The website PMCTrack calculates the outcomes for SSP recommendations by comparing Breeding and Transfer Plan recommendations to hatches and deaths recorded in the studbook. Of the recommendations proposed in the last breeding and transfer plan, 15.38% of the BREED WITH and 33.33% of SEND TO recommendations were fulfilled (Fig. 5). These outcome statistics are based on events recorded between the publication date of the last final plan (2015) and the inter-planning period end date on which updated studbook data were submitted (2017). There are many reasons that recommendations might not be fulfilled, including interim recommendations issued by the SSP Coordinator; these reasons can be captured using PMCTrack Outcomes Surveys. SSP participants are always encouraged to attempt to fulfill recommendations and to communicate successes and failures to the SSP Coordinator.

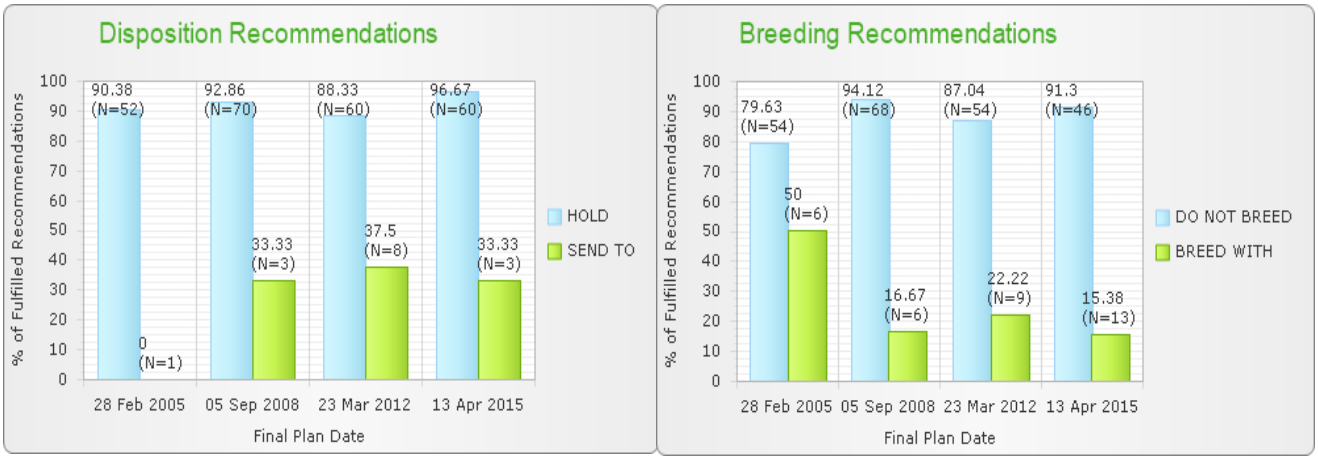


Figure 5: Recommendation outcome graphs by disposition (left) and breeding (right) for the past Spectacled Owl SSP Breeding and Transfer Plans. *N* represents the number of recommendations scored for each recommendation type, per plan, and the number represents the percentage recommendations fulfilled. Please visit PMCTrack.org or contact pmctrack@lpzoo.org for more information or with any questions.

Management Strategy:
To maintain the population at its current size of 76 birds (λ = 1.00), approximately 2 hatches are needed over the coming year, and approximately 5-6 hatches are needed annually to grow to a 5-year target size of 85 birds (λ=1.018). Reaching these demographic goals appear reasonable given the average number of 5 hatches annually over the past five years (2012 – 2016). Interest in breeding has increased some from previous reports and will help toward growth to the target size. As with all SSPs, pairings are based on mean kinship, avoidance of inbreeding, avoidance of linking rare and common lineages, and logistical constraints identified by the participating institutions.

The SSP is still working to import 4 – 6 orphaned or rehabilitated owls from Trinidad facilities by the end of 2019 which will further support the demographic and genetic health of this population. Importing animals from other South American regions or other zoo regions (e.g. Europe) are also viable options. Institutions interested in participating in this process are encouraged to contact the SSP coordinator for details.

Within the existing demographic and spatial limits, the SSP identified pairings based on mean kinship (pairing individuals with equal/similar and low mean kinships), avoidance of inbreeding, and logistical concerns. In addition to genetic considerations, demographic and space concerns impose a limit on the number of birds that are recommended to breed.

Summary Actions:

1. **SSP recommends 13 females for breeding. Institutions are expected to hold offspring for a minimum of 1 year.**
    - Breeding pairs are recommended to produce one clutch and then contact the SSP Coordinator for further guidance on whether or not more offspring are needed for the population.

2. **SSP recommends 9 transfers to create new breeding pairs and fulfill institutional requests.**

3. Please determine the sex of all currently unknown sex birds at earliest convenience to facilitate management.

4. Any institutions wishing to assist with imports from Trinidad or other regions in the future should contact the SSP Coordinator.

5. Any institutions willing to rotate education animals into breeding situations to assist population maintenance and growth are encouraged to contact the SSP Coordinator.

    a. Genetically valuable education birds can be identified by the SSP Coordinator.
    b. In general, males are easier to integrate into breeding roles from ambassador roles and will be alternated in before females if possible.

Summary of Breeding and Transfer Recommendations

By Studbook ID

Studbook ID	Location	Sex	Age	Disposition	Location	Breeding	With	Notes
30	FORTWORTH	M	39	HOLD	FORTWORTH	BREED WITH	139	Ambassador
37	DALLAS WA	F	31	HOLD	DALLAS WA	DO NOT BREED		Excluded - Age
45	ST LOUIS	M	---	HOLD	ST LOUIS	DO NOT BREED		Excluded - Medical
55	KANSASCTY	M	28	HOLD	KANSASCTY	DO NOT BREED		Excluded - Ambassador Animal
57	AUDUBON	M	28	HOLD	AUDUBON	BREED WITH	110	
59	ROCKTON	M	28	HOLD	ROCKTON	DO NOT BREED		Excluded - Ambassador Animal
66	TRACY AV	M	27	HOLD	TRACY AV	DO NOT BREED		
70	SANDIEGOZ	M	26	HOLD	SANDIEGOZ	DO NOT BREED		Excluded - Ambassador Animal
71	ST LOUIS	M	26	HOLD	ST LOUIS	DO NOT BREED		Excluded - Ambassador Animal
76	DALLAS	F	25	HOLD	DALLAS	DO NOT BREED		Excluded - Ambassador Animal
78	PHOENIX	M	25	HOLD	PHOENIX	BREED WITH	95	
81	BUSCH TAM	F	24	HOLD	BUSCH TAM	DO NOT BREED		
82	SEATTLE	M	24	HOLD	SEATTLE	DO NOT BREED		Excluded - Ambassador Animal
83	WORLDBIRD	F	24	HOLD	WORLDBIRD	DO NOT BREED		Excluded - Ambassador Animal
86	PARAMUS	M	24	SEND TO	SALISBURY	BREED WITH	219	
95	PHOENIX	F	23	HOLD	PHOENIX	BREED WITH	78	
97	BIRMINGHM	F	23	HOLD	BIRMINGHM	BREED WITH	242	
106	CINCINNAT	F	22	HOLD	CINCINNAT	DO NOT BREED		
108	TOLEDO	F	21	SEND TO	LOSANGELE	BREED WITH	183	Breed for education purposes
110	AUDUBON	F	21	HOLD	AUDUBON	BREED WITH	57	
118	LUU P	F	20	HOLD	LUU P	BREED WITH	141	
119	TULSA	F	20	HOLD	TULSA	DO NOT BREED		
123	STONEHAM	F	20	SEND TO	DALLAS	BREED WITH	125	
125	ST LOUIS	M	19	SEND TO	DALLAS	BREED WITH	123	
128	SAN ANTON	F	26	HOLD	SAN ANTON	BREED WITH	145	
130	NY BRONX	M	20	HOLD	NY BRONX	DO NOT BREED		Excluded - Ambassador Animal
135	LUFKIN	M	19	HOLD	LUFKIN	BREED WITH	195	
137	PARAMUS	F	18	HOLD	PARAMUS	BREED WITH	193	
139	FORTWORTH	F	17	HOLD	FORTWORTH	BREED WITH	30	Ambassador Animal
141	LOSANGELE	M	17	SEND TO	LUU P	BREED WITH	118	Ambassador Animal
143	PHOENIX	M	17	HOLD	PHOENIX	DO NOT BREED		Excluded - Ambassador Animal
145	SAN ANTON	M	17	HOLD	SAN ANTON	BREED WITH	128	
147	DALLAS WA	M	16	HOLD	DALLAS WA	DO NOT BREED		

Studbook ID	Location	Sex	Age	Disposition	Location	Breeding	With	Notes
148	TRACY AV	F	14	HOLD	TRACY AV	DO NOT BREED		
149	FORTWORTH	M	14	HOLD	FORTWORTH	DO NOT BREED		Excluded - Ambassador Animal
150	TULSA	M	14	HOLD	TULSA	DO NOT BREED		
160	ROCKTON	F	16	HOLD	ROCKTON	DO NOT BREED		
163	LUU P	M	15	HOLD	LUU P	DO NOT BREED		
167	DISNEY AK	F	20	HOLD	DISNEY AK	DO NOT BREED		Excluded - Ambassador Animal
169	SALISBURY	F	20	HOLD	SALISBURY	DO NOT BREED		Excluded - Ambassador Animal
182	CINCINNAT	F	12	HOLD	CINCINNAT	DO NOT BREED		Excluded - Ambassador Animal
183	BIRMINGHM	M	11	SEND TO	LOSANGELE	BREED WITH	108	
184	PHILADELP	M	11	HOLD	PHILADELP	DO NOT BREED		Excluded - Ambassador Animal
185	SAN ANTON	M	11	HOLD	SAN ANTON	DO NOT BREED		
188	NATAVPGH	M	10	HOLD	NATAVPGH	DO NOT BREED		Excluded - Ambassador Animal
189	LUU P	F	10	HOLD	LUU P	DO NOT BREED		
190	LUFKIN	M	9	HOLD	LUFKIN	DO NOT BREED		
193	LUFKIN	M	9	SEND TO	PARAMUS	BREED WITH	137	
195	LUFKIN	F	10	HOLD	LUFKIN	BREED WITH	135	
197	CINCINNAT	M	10	HOLD	CINCINNAT	DO NOT BREED		
198	SAN FRAN	M	9	HOLD	SAN FRAN	DO NOT BREED		Excluded - Ambassador Animal
201	TULSA	U	9	HOLD	TULSA	DO NOT BREED		Excluded - Ambassador Animal
205	TORONTO	F	12	HOLD	TORONTO	DO NOT BREED		
206	TORONTO	M	11	HOLD	TORONTO	DO NOT BREED		
208	MINNESOTA	M	8	SEND TO	ST LOUIS	BREED WITH	222	
215	DALLAS WA	M	6	HOLD	DALLAS WA	DO NOT BREED		Excluded - Ambassador Animal
216	TORONTO	M	6	HOLD	TORONTO	DO NOT BREED		Excluded - Ambassador Animal
219	SALISBURY	F	6	HOLD	SALISBURY	BREED WITH	86	
222	ST LOUIS	F	3	HOLD	ST LOUIS	BREED WITH	208	
223	DULUTH	F	3	HOLD	DULUTH	DO NOT BREED		
225	LUFKIN	F	4	HOLD	LUFKIN	DO NOT BREED		
228	BRDS PREY	F	11	HOLD	BRDS PREY	BREED WITH	229	
229	BRDS PREY	M	7	HOLD	BRDS PREY	BREED WITH	228	
231	ROCKTON	U	3	HOLD	ROCKTON	DO NOT BREED		
232	SANTA ANA	M	2	HOLD	SANTA ANA	DO NOT BREED		Excluded - Ambassador Animal
~~234~~	~~SALISBURY~~	~~F~~	~~2~~	~~SEND TO~~	~~DALLAS WA~~	~~BREED WITH~~	~~147~~	*Female sent LTF during comment period*
236	TORONTO	U	2	HOLD	TORONTO	DO NOT BREED		Excluded - Ambassador Animal

Studbook ID	Location	Sex	Age	Disposition	Location	Breeding	With	Notes
240	DALLAS	M	1	HOLD	DALLAS	DO NOT BREED		Excluded - Ambassador Animal
242	LUU P	M	1	SEND TO	BIRMINGHM	BREED WITH	97	
244	BRDS PREY	F	1	HOLD	BRDS PREY	DO NOT BREED		Excluded - Ambassador Animal
245	ROCKTON	U	0	HOLD	ROCKTON	DO NOT BREED		
246	ROCKTON	U	0	HOLD	ROCKTON	DO NOT BREED		
247	FORTWORTH	M	1	HOLD	FORTWORTH	DO NOT BREED		Excluded - Ambassador Animal
248	LUU P	U	0	HOLD	LUU P	DO NOT BREED		
249	TRACY AV	U	0	HOLD	TRACY AV	DO NOT BREED		Excluded - Ambassador Animal
250	TRACY AV	U	0	HOLD	TRACY AV	DO NOT BREED		Excluded - Ambassador Animal

Breeding and Transfer Recommendations by Institution

AUDUBON

Audubon Zoo
New Orleans, LA

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
57	103431	M	28	HOLD	AUDUBON	BREED WITH	110	
110	100707	F	21	HOLD	AUDUBON	BREED WITH	57	

BIRMINGHM

Birmingham Zoo
Birmingham, AL

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
97	94B117	F	23	HOLD	BIRMINGHM	BREED WITH	242	
183	208068	M	11	SEND TO	LOSANGELE	BREED WITH	108	
242	_____	M	1	RECEIVE FROM	LUU P	BREED WITH	97	

BUSCH TAM

Busch Gardens Tampa Bay
Tampa, FL

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
81	65230	F	24	HOLD	BUSCH TAM	DO NOT BREED		

BRDS PREY (Non-AZA; previously listed as CENTR BOP)

Center for Birds of Prey
Awendaw, SC

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
228	03ICBP	F	11	HOLD	BRDS PREY	BREED WITH	229	
229	AN1053	M	7	HOLD	BRDS PREY	BREED WITH	228	
244	PSC105	F	1	HOLD	BRDS PREY	DO NOT BREED		Excluded - Ambassador Animal

CINCINNAT

Cincinnati Zoo & Botanical Garden
Cincinnati, OH

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
106	215008	F	22	HOLD	CINCINNAT	DO NOT BREED		
182	206080	F	12	HOLD	CINCINNAT	DO NOT BREED		Excluded - Ambassador Animal
197	215009	M	10	HOLD	CINCINNAT	DO NOT BREED		

DALLAS

Dallas Zoo
Dallas, TX

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
76	938226	F	25	HOLD	DALLAS	DO NOT BREED		Excluded - Ambassador Animal
240	16T021	M	1	HOLD	DALLAS	DO NOT BREED		Excluded - Ambassador Animal
123	A00525	F	20	RECEIVE FROM	STONEHAM	BREED WITH	125	
125	110742	M	19	RECEIVE FROM	ST LOUIS	BREED WITH	123	

DALLAS WA

Dallas World Aquarium
Dallas, TX

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
37	4A015	F	31	HOLD	DALLAS WA	DO NOT BREED		Excluded - Age
147	14A019	M	16	HOLD	DALLAS WA	DO NOT BREED		
215	10AB61	M	6	HOLD	DALLAS WA	DO NOT BREED		Excluded - Ambassador Animal
~~234~~	~~1918~~	~~F~~	~~2~~	~~RECEIVE FROM~~	~~SALISBURY~~	~~BREED WITH~~	~~147~~	*Female made LTF over comment period*

DISNEY AK

Disney's Animal Kingdom
Bay Lake, FL

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
167	970398	F	20	HOLD	DISNEY AK	DO NOT BREED		Excluded - Ambassador Animal

DULUTH

Lake Superior Zoological Gardens
Duluth, MN

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
223	200223	F	3	HOLD	DULUTH	DO NOT BREED		

FORTWORTH

Fort Worth Zoological Park
Ft Worth, TX

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
30	930304	M	39	HOLD	FORTWORTH	BREED WITH	139	Ambassador Animal
139	200303	F	17	HOLD	FORTWORTH	BREED WITH	30	Ambassador Animal
149	201511	M	14	HOLD	FORTWORTH	DO NOT BREED		Excluded - Ambassador Animal
247	209421	M	1	HOLD	FORTWORTH	DO NOT BREED		Excluded - Ambassador Animal

KANSASCTY

Kansas City Zoo
Kansas City, MO

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
55	A01005	M	28	HOLD	KANSASCTY	DO NOT BREED		Excluded - Ambassador Animal

LOSANGELE

Los Angeles Zoo & Botanical Gardens
Los Angeles, CA

Institutional Note: Males have been recorded breeding into their mid-20s and in one male, into the 30's. The SSP is recommending breeding this male elsewhere in the population. The recommended incoming pair can be used for education purposes and/or bred to fill education needs at institutional discretion.

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
108	961632	F	21	RECEIVE FROM	TOLEDO	BREED WITH	183	
141	994263	M	17	SEND TO	LUU P	BREED WITH	118	Ambassador animal
183	208068	M	11	RECEIVE FROM	BIRMINGHM	BREED WITH	108	

LUFKIN

Ellen Trout Zoo
Lufkin, TX

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
135	9001	M	19	HOLD	LUFKIN	BREED WITH	195	
190	9984	M	9	HOLD	LUFKIN	DO NOT BREED		
193	10095	M	9	SEND TO	PARAMUS	BREED WITH	137	
195	10356	F	10	HOLD	LUFKIN	BREED WITH	135	
225	10500	F	4	HOLD	LUFKIN	DO NOT BREED		

LUU P (non-AZA)

Phung T. Luu (Behavior & Training Solutions)
Wilmington, DE

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
118	_____	F	20	HOLD	LUU P	BREED WITH	141	
141	994263	M	17	RECEIVE FROM	LOSANGELE	BREED WITH	118	Ambassador animal
163	_____	M	15	HOLD	LUU P	DO NOT BREED		
189	_____	F	10	HOLD	LUU P	DO NOT BREED		
242	_____	M	1	SEND TO	BIRMINGHM	BREED WITH	97	
248	_____	U	0	HOLD	LUU P	DO NOT BREED		

MINNESOTA

Minnesota Zoological Garden
Apple Valley, MN

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
208	12644	M	8	SEND TO	ST LOUIS	BREED WITH	222	

NY BRONX

Bronx Zoo/Wildlife Conservation Society
Bronx, NY

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
130	983010	M	20	HOLD	NY BRONX	DO NOT BREED		Excluded - Ambassador Animal

PARAMUS

Bergen County Zoological Park
Paramus, NJ

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
86	2621	M	24	SEND TO	SALISBURY	BREED WITH	219	
137	2616	F	18	HOLD	PARAMUS	BREED WITH	193	
193	10095	M	9	RECEIVE FROM	LUFKIN	BREED WITH	137	

PHILADELP

The Philadelphia Zoo
Philadelphia, PA

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
184	205536	M	11	HOLD	PHILADELP	DO NOT BREED		Excluded - Ambassador Animal

PHOENIX

Phoenix Zoo
Phoenix, AZ

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
78	6841	M	25	HOLD	PHOENIX	BREED WITH	95	
95	6918	F	23	HOLD	PHOENIX	BREED WITH	78	
143	9124	M	17	HOLD	PHOENIX	DO NOT BREED		Excluded - Ambassador Animal

NATAVPGH (Formerly PITTS CA)

National Aviary in Pittsburgh
Pittsburgh, PA

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
188	7474	M	10	HOLD	NATAVPGH	DO NOT BREED		Excluded - Ambassador Animal

ROCKTON (non-AZA)

African Lion Safari & Game Farm Ltd
Cambridge, Ontario, Canada

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
59	2226	M	28	HOLD	ROCKTON	DO NOT BREED		Excluded - Ambassador Animal
160	A2B010	F	16	HOLD	ROCKTON	DO NOT BREED		
231	LS1471	U	3	HOLD	ROCKTON	DO NOT BREED		
245	SCAN68	U	0	HOLD	ROCKTON	DO NOT BREED		
246	SCAN69	U	0	HOLD	ROCKTON	DO NOT BREED		

SALISBURY

Salisbury Zoological Park
Salisbury, MD

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
86	2621	M	24	RECEIVE FROM	PARAMUS	BREED WITH	219	
169	1189	F	20	HOLD	SALISBURY	DO NOT BREED		Excluded - Ambassador Animal
219	1943	F	6	HOLD	SALISBURY	BREED WITH	86	
~~234~~	~~1918~~	~~F~~	~~2~~	~~SEND TO~~	~~DALLAS WA~~	~~BREED WITH~~	~~147~~	*Female made LTF over comment period*

SAN ANTON

San Antonio Zoological Gardens & Aquarium
San Antonio, TX

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
128	A05001	F	26	HOLD	SAN ANTON	BREED WITH	145	
145	000049	M	17	HOLD	SAN ANTON	BREED WITH	128	
185	A15002	M	11	HOLD	SAN ANTON	DO NOT BREED		

SAN FRAN

San Francisco Zoological Gardens
San Francisco, CA

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
198	208020	M	9	HOLD	SAN FRAN	DO NOT BREED		Excluded - Ambassador Animal

SANDIEGOZ

San Diego Zoo
San Diego, CA

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
70	391231	M	26	HOLD	SANDIEGOZ	DO NOT BREED		Excluded - Ambassador Animal

SANTA ANA (non-AZA)
Santa Ana Zoo
Santa Ana, CA

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
232	B14020	M	2	HOLD	SANTA ANA	DO NOT BREED		Excluded - Ambassador Animal

SEATTLE
Woodland Park Zoo
Seattle, WA

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
82	920532	M	24	HOLD	SEATTLE	DO NOT BREED		Excluded - Ambassador Animal

ST LOUIS
Saint Louis Zoological Park
St. Louis, MO

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
45	930519	M	---	HOLD	ST LOUIS	DO NOT BREED		Excluded - Medical
71	910507	M	26	HOLD	ST LOUIS	DO NOT BREED		Excluded - Ambassador Animal
125	110742	M	19	SEND TO	DALLAS	BREED WITH	123	
222	116287	F	3	HOLD	ST LOUIS	BREED WITH	208	
208	12644	M	8	RECEIVE FROM	MINNESOTA	BREED WITH	222	

STONEHAM
Zoo New England
Boston, MA

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
123	A00525	F	20	SEND TO	DALLAS	BREED WITH	125	

TOLEDO
Toledo Zoological Gardens
Toledo, OH

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
108	961632	F	21	SEND TO	LOSANGELE	BREED WITH	183	

TORONTO
Toronto Zoo
Scarborough, Ontario, Canada

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
205	42693	F	12	HOLD	TORONTO	DO NOT BREED		
206	41005	M	11	HOLD	TORONTO	DO NOT BREED		
216	44250	M	6	HOLD	TORONTO	DO NOT BREED		Excluded - Ambassador Animal
236	47932	U	2	HOLD	TORONTO	DO NOT BREED		Excluded - Ambassador Animal

TRACY AV

Tracy Aviary
Salt Lake City, UT

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
66	2438	M	27	HOLD	TRACY AV	DO NOT BREED		
148	2366	F	14	HOLD	TRACY AV	DO NOT BREED		
249	3086	U	0	HOLD	TRACY AV	DO NOT BREED		Excluded - Ambassador Animal
250		U	0	HOLD	TRACY AV	DO NOT BREED		Excluded - Ambassador Animal

TULSA

Tulsa Zoo
Tulsa, OK

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
119	12155	F	20	HOLD	TULSA	DO NOT BREED		
150	14588	M	14	HOLD	TULSA	DO NOT BREED		
201	15548	U	9	HOLD	TULSA	DO NOT BREED		Excluded - Ambassador Animal

WORLDBIRD

Natural Encounters
Winter Haven, FL

Studbook ID	Local ID	Sex	Age	Disposition	Location	Breeding	With	Notes
83	920639	F	24	HOLD	WORLDBIRD	DO NOT BREED		Excluded - Ambassador Animal

Appendix A: Pedigree Assumptions

Note for 2017 analysis: Previous hypothetical animals, HYP3 and HYP4 were deleted and the three potential dams were consolidated into a MULT to better account for dam probabilities (SEE SB#144 assumptions). No other changes were made to assumptions from 2015 analysis.

Hypothetical Individuals

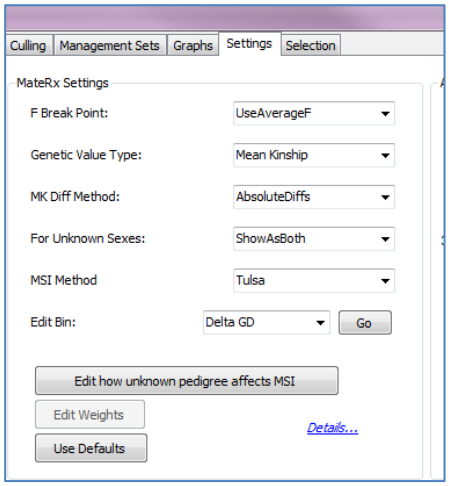
ID	Sire	Dam	Sex	Notes
HYP001	37	105		Master Analytical Notes: Hypothetical dam is combination of potential dams 37 and 105 in MULT 1 at DALLAS WA. 37 is 105's aunt.
HYP2	99	46		Master Analytical Notes_2015 update: These two males are potential sires for 144.

Analytical Data for True Individuals

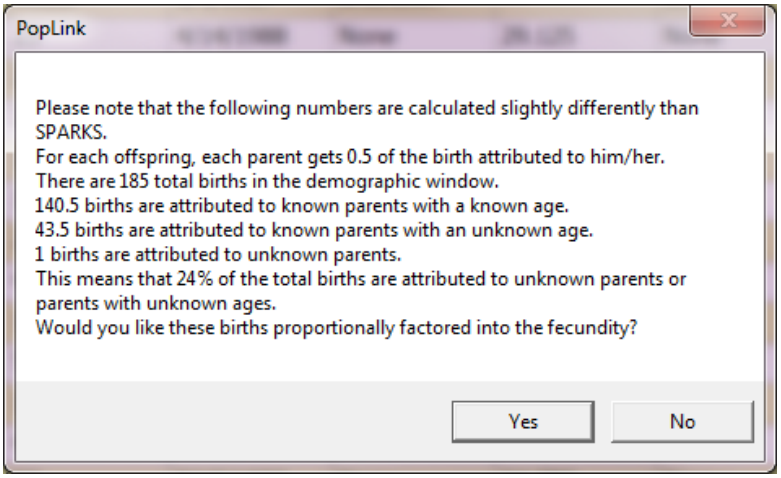
ID	Field	TRUE	Overlay	Notes
145	Dam	UNK	WILD	Master Analytical Notes: Obtained from Ornatus Aviaries in Georgia, private collection. Assumed to be wild caught.
	Sire	UNK	WILD	
153	Dam	WILD	WILD	Master Analytical Notes: Obtained from Chris Jonsson in Georgia, private collection. Assumed to be wild caught.
	Sire	WILD	WILD	
18	Dam	WILD	WILD	Master Analytical Notes: Obtained by Oklahoma from Chase, known bird importer, assumed to be wild caught.
	Sire	WILD	WILD	
181	Dam	MULT	HYP001	Master Analytical Notes: Hypothetical dam is combination of potential dams 37 and 105 in MULT1 at DALLAS WA. 37 is 105's aunt.
19	Dam	UNK	WILD	Master Analytical Notes: Obtained by Ft. Wayne in about 1971, well before first recorded captive hatch in 1978; assumed wild caught.
	Sire	UNK	WILD	
203	Dam	UNK	WILD	Master Analytical Notes: Obtained from Bird purchased from Rolf Krahe, Driftwood. Assumed to be wild caught and unrelated to North American birds (As per studbook note).
	Sire	UNK	WILD	
21	Dam	UNK	WILD	Master Analytical Notes: Assumed wild caught by early date.
	Sire	UNK	WILD	
215	Dam	MULT2	HYP001	Master Analytical Notes: Hypothetical dam is combination of potential dams 37 and 105 in MULT1 at DALLAS WA. 37 is 105's aunt.
22	Dam	UNK	WILD	Master Analytical Notes: Assumed to be wild caught because of early date.
	Sire	UNK	WILD	
23	Dam	WILD	WILD	Master Analytical Notes: Assumed to be wild caught; obtained from private individuals in California.
	Sire	WILD	WILD	
24	Dam	WILD	WILD	Master Analytical Notes: Obtained by Antwerp from unknown source. Based on early data and European origin, assume wild caught or unrelated to other North American birds.
	Sire	WILD	WILD	
25	Dam	WILD	WILD	Master Analytical Notes: Obtained by Antwerp from unknown source. Based on early date and European origin, assume wild caught or unrelated to other North American birds.
	Sire	WILD	WILD	
26	Dam	UNK	WILD	Master Analytical Notes: Assumed to be wild caught, obtained from a private individual in New Jersey.
	Sire	UNK	WILD	
27	Dam	UNK	WILD	Master Analytical Notes: Assumed to be wild caught, obtained from a private individual in Texas.
	Sire	UNK	WILD	
28	Dam	WILD	WILD	Master Analytical Notes: Assumed to be wild caught; noted in studbook record (1992).
	Sire	WILD	WILD	
29	Dam	UNK	WILD	Master Analytical Notes: Assumed to be wild caught; obtained by Colorado Springs in 1975 from Chase.
	Sire	UNK	WILD	
38	Dam	WILD	WILD	Master Analytical Notes: Obtained from Exotics Unlimited in Miami (A. Alentado) and assumed to be wild caught.
	Sire	WILD	WILD	
39	Dam	WILD	WILD	Master Analytical Notes: Obtained from Exotics Unlimited in Miami (A. Alentado) and assumed to be wild caught.
	Sire	WILD	WILD	
45	Dam	WILD	WILD	Master Analytical Notes: Obtained from Exotics Unlimited in Miami (A. Alentado) and assumed to be wild caught.
	Sire	WILD	WILD	
46	Dam	WILD	WILD	Master Analytical Notes: Obtained from Exotics Unlimited in Miami (A. Alentado) and assumed to be wild caught.
	Sire	WILD	WILD	
144	Dam	46	MULT5 PMx Ped	2015 UPDATE: HYP 4 = combination of 3 possible dams (106, 123, 124). HYP3 consists of 106 and 123 and was randomly assigned b/c all three females have equal chance of being dams given available information. 2017: Updated again to include the 3 dams as MULT and more accurately parse out dam probability among the same three potential dams as before. In doing this, HYP3 and HYP4 were eliminated.
	Sire	99	HYP2	2015 UPDATE: HYP 2 = Combination of 2 possible sires, 99 and 46 present at the hatching facility of 144.

Appendix B: Summary of Data Exports

PMx Project: SpecOwl_3
Created: 2017-05-18 by PMx version 1.4.20161017
File: C:\PMxProjects\SpecOwl_3.pmxproj



Primary data file
Data File Name: XXSpecOwl_16May2017.ped
Common Name: SPECTACLED OWL
Scientific Name: PULSATRIX PERSPICILLATA
Data Source: PopLink
Studbook Name: SpecOwl_16May2017
Exported On: 2017-05-18
Software version: PopLink 2.4
Current through: 2017-02-28
Compiled by: Steve Sarro
Scope: North American regional
Dates: 2017-05-18
Locations:
Association: OWL_SPEC.FED = AZA + ROCKTON + (LUU P + PHUNG LUU) + BRDS PREY
Other Filters: Status = Living
User: jandrews



Locations data file
Data File Name: location.txt

Demographic input files
MPrn file: mXXSpecOwl_16May2017.prn
FPrn file: fXXSpecOwl_16May2017.prn
Census1 file: Exchcens.txt

Male/Female LifeTable filter:
*Common Name: SPECTACLED OWL
*Scientific Name: PULSATRIX PERSPICILLATA
*Data Source: PopLink
*Studbook Name: SpecOwl_16May2017
*Exported On: 2017-05-18
*Software version: PopLink 2.4
*Current through: 2017-02-28
*Compiled by: Steve Sarro
*Scope: North American regional
***Dates: 1980-01-01 to 2017-05-18**
***Locations: N.AMERICA**
*Association:
*Other Filters: Status = Living
*User: jandrews

*Animals with temporary IDs were added to the PMx analysis in draft period and are not yet included in the studbook. Final studbook used for report will have these animals included.

Appendix C: Animals Excluded from the Genetic Analysis

A total of 28 birds (17.7.4) were excluded from the potentially breeding population.

ID	Location	Sex	Age	Reason for exclusion
37	DALLAS WA	F	32	Age
45	ST LOUIS	M	U	Excluded due to health issues
55	KANSASCTY	M	28	Education animal
59	ROCKTON	M	28	Age, Education animal?
70	SANDIEGOZ	M	26	Education animal
71	ST LOUIS	M	26	Education animal
76	DALLAS	F	26	Age, Education animal
82	SEATTLE	M	25	Education animal
83	WORLDBIRD	F	25	Education animal
130	NY BRONX	M	20	Education animal
149	FORTWORTH	M	14	Education animal
143	PHOENIX	M	17	Education animal
167	DISNEY AK	F	20	Education animal
169	SALISBURY	F	21	Age, Education animal
182	CINCINNAT	F	12	Education animal
184	PHILADELP	M	11	Education animal
188	NATAVPGH	M	11	Education animal
198	SAN FRAN	M	10	Education animal
201	TULSA	U	9	Education animal
215	DALLAS WA	M	7	Education animal
216	TORONTO	M	7	Education animal
232	SANTA ANA	M	2	Education animal
236	TORONTO	U	2	Education animal
240	DALLAS	M	1	Education animal
244	BRDS PREY	F	1	Education animal assumed
247	FORTWORTH	M	1	Education animal
249	TRACY AV	U	0	Education animal
250	TRACY AV	U	0	Education animal

Appendix D: Life Tables

***Note:** Sample sizes for many older age classes are not sufficient to produce robust demographic data. Where these sample sizes are low, values may be unreliable.

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

MALES								FEMALES							
Aage	**Px**	**Qx**	**Risk Qx**	**Lx**	**Mx**	**Risk Mx**	**Vx**	**Age**	**Px**	**Qx**	**Risk Qx**	**Lx**	**Mx**	**Risk Mx**	**Vx**
0	0.77	0.23	87.90	1.00	0.02	68.50	1.13	0	0.73	0.27	87.40	1.00	0.00	64.60	1.16
1	0.99	0.01	61.40	0.77	0.01	61.00	1.37	1	0.99	0.01	59.60	0.73	0.01	59.10	1.45
2	1.00	0.00	58.00	0.76	0.05	58.00	1.46	2	1.00	0.00	57.40	0.72	0.10	57.50	1.52
3	1.00	0.00	55.10	0.76	0.13	55.10	1.51	3	0.98	0.02	51.80	0.72	0.13	51.40	1.50
4	0.99	0.01	53.10	0.76	0.16	52.80	1.49	4	0.99	0.01	47.70	0.71	0.09	47.30	1.47
5	0.96	0.04	53.40	0.75	0.15	52.20	1.46	5	1.00	0.00	47.80	0.70	0.19	47.80	1.45
6	1.00	0.00	50.30	0.72	0.13	50.30	1.43	6	0.98	0.02	46.40	0.70	0.15	45.70	1.34
7	1.00	0.00	45.90	0.72	0.12	45.90	1.39	7	1.00	0.00	42.50	0.69	0.16	42.50	1.27
8	1.00	0.00	44.10	0.72	0.16	44.20	1.36	8	0.95	0.05	42.00	0.69	0.27	40.50	1.19
9	0.98	0.02	41.90	0.72	0.22	41.30	1.30	9	0.97	0.03	39.60	0.65	0.16	38.70	1.01
10	1.00	0.00	38.50	0.71	0.10	38.60	1.16	10	1.00	0.00	37.30	0.63	0.31	37.40	0.91
11	0.97	0.03	35.20	0.71	0.11	35.30	1.15	11	1.00	0.00	35.50	0.63	0.18	35.50	0.63
12	1.00	0.00	32.50	0.69	0.10	32.50	1.13	12	0.97	0.03	33.90	0.63	0.08	33.90	0.48
13	0.91	0.09	32.50	0.69	0.08	31.00	1.16	13	1.00	0.00	32.50	0.61	0.11	32.50	0.42
14	0.96	0.04	27.90	0.63	0.02	27.80	1.24	14	0.94	0.06	32.70	0.61	0.08	32.60	0.34
15	0.92	0.08	25.50	0.60	0.05	24.30	1.38	15	0.97	0.03	30.50	0.58	0.02	30.20	0.28
16	1.00	0.00	22.80	0.55	0.08	22.80	1.49	16	0.93	0.07	28.10	0.56	0.05	27.60	0.29
17	1.00	0.00	19.60	0.55	0.06	19.70	1.51	17	0.92	0.08	25.20	0.52	0.06	24.10	0.27
18	1.00	0.00	17.50	0.55	0.00	17.50	1.55	18	0.91	0.09	21.80	0.48	0.07	20.80	0.25
19	0.94	0.06	16.50	0.55	0.04	15.90	1.71	19	0.90	0.10	19.50	0.44	0.16	17.80	0.21
20	1.00	0.00	13.90	0.52	0.23	13.90	1.84	20	1.00	0.00	14.30	0.39	0.05	14.50	0.05
21	1.00	0.00	12.30	0.52	0.15	12.40	1.73	21	0.91	0.09	10.80	0.39	0.00	10.70	0.00
22	0.92	0.08	12.00	0.52	0.06	11.10	1.76	22	1.00	0.00	8.10	0.36	0.00	8.10	0.00
23	1.00	0.00	11.00	0.48	0.12	11.00	1.90	23	1.00	0.00	7.00	0.36	0.00	7.10	0.00
24	1.00	0.00	10.40	0.48	0.36	10.50	1.90	24	0.82	0.18	5.60	0.36	0.00	5.40	0.00
25	1.00	0.00	8.30	0.48	0.23	8.40	1.65	25	1.00	0.00	2.70	0.29	0.00	2.70	0.00
26	1.00	0.00	6.10	0.48	0.41	6.20	1.52	26	1.00	0.00	1.40	0.29	0.00	1.50	0.00
27	1.00	0.00	5.00	0.48	0.13	5.10	1.18	27	1.00	0.00	1.00	0.29	0.00	1.00	0.00
28	1.00	0.00	2.40	0.48	0.00	2.50	1.13	28	1.00	0.00	1.00	0.29	0.00	1.00	0.00
29	1.00	0.00	1.10	0.48	0.00	1.10	1.21	29	1.00	0.00	1.00	0.29	0.00	1.00	0.00
30	1.00	0.00	1.00	0.48	0.00	1.00	1.29	30	1.00	0.00	1.00	0.29	0.00	1.00	0.00
31	1.00	0.00	1.00	0.48	0.00	1.00	1.38	31	1.00	0.00	0.90	0.29	0.00	0.90	0.00
32	1.00	0.00	1.00	0.48	0.00	1.00	1.48	32	1.00	0.00	0.00	0.29	0.00	0.00	0.00
33	1.00	0.00	1.00	0.48	0.00	1.00	1.58	33	1.00	0.00	0.00	0.29	0.00	0.00	0.00
34	1.00	0.00	1.00	0.48	0.63	1.00	1.69	34	1.00	0.00	0.00	0.29	0.00	0.00	0.00
35	1.00	0.00	1.00	0.48	0.00	1.00	1.14	35	1.00	0.00	0.00	0.29	0.00	0.00	0.00

MALES

Aage	Px	Qx	Risk Qx	Lx	Mx	Risk Mx	Vx
36	1.00	0.00	1.00	0.48	0.63	1.00	1.22
37	1.00	0.00	1.00	0.48	0.63	1.00	0.63
38	1.00	0.00	1.00	0.48	0.00	1.00	0.00
39	1.00	0.00	0.00	0.48	0.00	0.10	0.00
40	1.00	0.00	0.00	0.48	0.00	0.00	0.00
41	1.00	0.00	0.00	0.48	0.00	0.00	0.00

r = 0.0068, λ = 1.07, Ro = 2.27, T = 12.1, N@20 = 54

FEMALES

Age	Px	Qx	Risk Qx	Lx	Mx	Risk Mx	Vx
36	1.00	0.00	0.00	0.29	0.00	0.00	0.00
37	1.00	0.00	0.00	0.29	0.00	0.00	0.00
38	1.00	0.00	0.00	0.29	0.00	0.00	0.00
39	1.00	0.00	0.00	0.29	0.00	0.00	0.00
40	1.00	0.00	0.00	0.29	0.00	0.00	0.00
41	1.00	0.00	0.00	0.29	0.00	0.00	0.00

r = 0.05, λ = 1.051, Ro = 1.494, T = 8.1, N@20 = 54

Appendix E: Ordered Mean Kinship List

Note: *This list is current to August 2017 and based on an analytical studbook with pedigree assumptions. Values are subject to change with any hatch, death, import, export, inclusion, or exclusion. Unknown sex individuals are signified with a "U" by the age and will appear in both the male and female tables.*

Population MK = 0.0878

Male

Stbk#	MK	Known	Age	Location
145	0.0083	1.0000	17	SAN ANTON
242	0.0672	1.0000	1	LUU P
141	0.0760	1.0000	17	LOSANGELE
125	0.0760	1.0000	19	ST LOUIS
197	0.0769	1.0000	10	CINCINNAT
163	0.0769	1.0000	15	LUU P
135	0.0777	1.0000	19	LUFKIN
78	0.0787	1.0000	25	PHOENIX
183	0.0817	1.0000	11	BIRMINGHM
190	0.0817	1.0000	9	LUFKIN
193	0.0817	1.0000	9	LUFKIN
185	0.0817	1.0000	11	SAN ANTON
57	0.0819	1.0000	28	AUDUBON
30	0.0861	1.0000	39	FORTWORTH
248	0.0866	1.0000	U 0	PHUNG LUU
150	0.0922	1.0000	14	TULSA
147	0.0955	1.0000	16	DALLAS WA
206	0.0982	1.0000	11	TORONTO
86	0.1033	1.0000	24	PARAMUS
245	0.1147	1.0000	U 0	ROCKTON
246	0.1147	1.0000	U 0	ROCKTON
208	0.1158	1.0000	8	MINNESOTA
231	0.1158	1.0000	U 3	ROCKTON
66	0.1184	1.0000	27	TRACY AV
229	0.1185	1.0000	7	BRDS PREY

Female

Stbk#	MK	Known	Age	Location
228	0.0056	1.0000	11	BRDS PREY
189	0.0111	1.0000	10	LUU P
128	0.0139	1.0000	26	SAN ANTON
195	0.0194	1.0000	10	LUFKIN
139	0.0391	1.0000	17	FORTWORTH
225	0.0541	1.0000	4	LUFKIN
106	0.0732	1.0000	22	CINCINNAT
97	0.0747	1.0000	23	BIRMINGHM
110	0.0802	1.0000	21	AUDUBON
223	0.0866	1.0000	3	DULUTH
~~234~~	~~0.0866~~	~~1.0000~~	~~2~~	~~SALISBURY~~
222	0.0866	1.0000	3	ST LOUIS
248	0.0866	1.0000	U 0	PHUNG LUU
81	0.0903	1.0000	24	BUSCH TAM
123	0.0918	1.0000	20	STONEHAM
219	0.0922	1.0000	6	SALISBURY
148	0.0922	1.0000	14	TRACY AV
118	0.0929	1.0000	20	LUU P
95	0.0929	1.0000	23	PHOENIX
119	0.0929	1.0000	20	TULSA
137	0.0955	1.0000	18	PARAMUS
108	0.1012	1.0000	21	TOLEDO
245	0.1147	1.0000	U 0	ROCKTON
246	0.1147	1.0000	U 0	ROCKTON
231	0.1158	1.0000	U 3	ROCKTON
160	0.1208	1.0000	16	ROCKTON
205	0.1212	1.0000	12	TORONTO

Appendix F: Descriptive Survival Statistics Report

SPECTACLED OWL PULSATRIX PERSPICILLATA Studbook
North American regional 2YHOSTC.Smithsonian National Zoological Park Studbook

Studbook data current as of 2/28/2017

Compiled by: Steve Sarro

PopLink Studbook filename: SpecOwl_16May2017
PopLink User Who Exported Report: jandrews
Date of Export: 5/29/2017
Data Filtered by: **Locations = N.AMERICA AND StartDate = 1/1/1980 AND EndDate = 5/29/2017**
PopLink Version: 2.4

REPORT OVERVIEW:

Data for SPECTACLED OWL were not of sufficient robustness to analyze and report survival statistics. See the body of the report for further details.

BACKGROUND ON ANALYSES:

These analyses were conducted using animals that lived during the period 1 January 1980 to 29 May 2017 at all institutions in the studbook. The analyses mainly focus on survival statistics from 1 year (e.g. excluding any individuals that did not survive past their first birthday). These statistics most accurately reflect typical survival for animals which can be seen on exhibit in zoos and aquariums.

This report summarizes survival records of individuals housed at zoological facilities for a specific geographic range and time period; these records trace an individual's history from birth or entry into the population to death, exit out of the population, or the end of the time period. As such, this history only reflects standard practices - including management, husbandry, and acquisition/disposition practices - for the specified time period and geographic range. Thus, the report contents should be viewed with some caution as they may not fully reflect current and newly emerging zoo and aquarium management techniques or practices. For example, if the population has not been maintained in zoos and aquariums long enough to have many adults living into old age, median life expectancy will likely be an underestimate until more data accrue in older age classes. Thus, users of these reports should recognize that the results produced will likely vary over time or depending on the subset of data selected.

SUMMARY OF ANALYSES:

SURVIVAL STATISTICS

Unfortunately, **data were not robust enough to analyze and report survival statistics**[1] (see Data Quality section). The dataset used for analysis includes partial or full lifespans of 136 individuals, 36 (26.5%) of which had died by 29 May 2017. These data are not sufficient for further analysis.

For general reference, data are provided on the oldest individuals in the dataset defined with the analysis window. Please note that these are the individual's ages as of the end date of the demographic window (29 May 2017); for the most up-to-date ages of the oldest animals in this population, you should contact the studbook keeper for this species directly.

10 Oldest Censored Individuals[2]

Studbook ID	Sex	Birth Type	Age at Censoring	Birth Date Est.	Exit Method
30	Male	Captive Hatch	39.1	None	alive at end of window
37	Female	Captive Hatch	31.9	None	alive at end of window
51	Male	Captive Hatch	29.1	None	alive at end of window
55	Male	Captive Hatch	28.2	None	alive at end of window
57	Male	Captive Hatch	28.1	None	alive at end of window

59	Male	Captive Hatch	28.1	None	alive at end of window
66	Male	Captive Hatch	27.1	None	alive at end of window
128	Female	Wild Hatch	26.5	Year	alive at end of window
70	Male	Captive Hatch	26.1	None	alive at end of window
71	Male	Captive Hatch	26.1	None	alive at end of window

10 Oldest Dead Individuals

Studbook ID	Sex	Birth Type	Age at Death	Birth Date Est.
33	Female	Captive Hatch	24.7	None
50	Female	Captive Hatch	24.4	None
52	Male	Captive Hatch	22.1	None
65	Female	Captive Hatch	21.8	None
58	Male	Captive Hatch	19.4	None
93	Female	Captive Hatch	19.2	None
122	Female	Captive Hatch	19.0	None
11	Female	Wild Hatch	19.0	Year
105	Female	Captive Hatch	18.1	None
126	Female	Captive Hatch	17.7	None

The PopLink Age Outliers report can give further information on these and other 'old' individuals within the studbook dataset.

DATA QUALITY

The PopLink Survival Tool uses five data quality measures to determine whether data are robust enough to make reliable estimates of key survival parameters. **This population failed at least one of the following tests:**

1. Can the median life expectancy be calculated? **PASS**
2. Is the sample size (number of individuals at risk) greater than 20 individuals at the median? **FAIL**
3. Is the 95% Confidence Interval (CI) bounded? **FAIL**
4. Is the sample size in the first age class of analysis (e.g. the first day of analysis) greater than 30 individuals? **PASS**
5. Is the length of the 95% CI < 33% of the maximum longevity? **FAIL**

PopLink data validation has never been run; if errors are present in this studbook, they may affect the data in this analysis.

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[1] The statistics analyzed for this report (median life expectancy, 95% confidence limits, and age to which 25% of individuals survive) exclude any individuals who did not survive to their first birthday; these individuals are excluded because this Report is focused on providing median survival estimates for the typical individual that survives the vulnerable infant stage. In other words, this report answers the question, 'how long is this species expected to live once it has reached its first birthday?' For this studbook, 44 individuals died before their first birthday and were excluded from these analyses.

For all animals that survive to their first birthday, 50% will die before the median life expectancy in this report and 50% die after. Note that the median life expectancy obtained from population management software (PM2000, PMx, ZooRisk) or from life tables in Breeding and Transfer Plans (e.g. where Lx = 0.5) will be lower because it includes these individuals that did not survive to their first birthday in order to project the correct number of births needed. See the PopLink manual for more details.

[2] Censored individuals are individuals whose deaths have not been observed as of the end of the analysis window, including individuals who 1) are still alive as of the end date, 2) exited the geographic window before the end date (through transfer or release), or 3) were lost-to-follow up before the end date.

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 Species Survival Plan® (Red SSP) Program – A Red SSP has a population size of greater than 20 but fewer than 50 animals, at least three AZA member institutions, and a published studbook. Animal Programs that manage species designated as Extinct in the Wild, Critically Endangered, or Endangered (IUCN) do not need to meet minimum population size and number of participating institution criteria to be designated as an SSP Program. 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 Policy on Responsible Population Management and the AZA Code of Professional Ethics. For more information on AZA policies, see https://www.aza.org/board-approved-policies-and-position-statements.

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 (□) 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 0.97 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.

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.

Mx, Fecundity – The average number of same-sexed young born to animals in that age class. Because studbooks typically have relatively small sample sizes, studbook software calculate 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. Alternatively, 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").

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.

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 Ne) -- 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).

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 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 Representation -- Proportion of the genes in the living, descendant population that are derived from that founder.

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.

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.

Percent Certain -- The percentage of the living individuals' pedigree that can be completely identified as certain: (exact identity of both parents is known) and traceable back to known founders. Individuals that are 100% certain do not have any MULTs or UNKs in their pedigree. Certainty represents a higher degree of knowledge than Known and therefore is always less than or equal to Known.

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, Vx.

Appendix H: Directory of Institutional Representatives

Contact Name (IR)	Institution	Email
Carolyn Atherton	AUDUBON - Audubon Zoo, New Orleans, LA	catherton@auduboninstitute.org
Cindy Pinger	BIRMINGHM - Birmingham Zoo, Birmingham, AL	cpinger@birminghamzoo.com
Michael Malden	BUSCH TAM – Busch Gardens Tampa Bay, Tampa, FL	Michael.malden@buschgardens.com
Colleen Baird	CALGARY - Calgary Zoo, Calgary, Alberta	ColleenB@calgaryzoo.com
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Jennifer Gainer	CINCINNAT - Cincinnati Zoo & Botanical Garden, Cincinnati, OH	Jennifer.Gainer@cincinnatizoo.org
Tracy Thessing	COLO SPRG - Cheyenne Mtn Zoological Park, Colorado Springs, CO	tthessing@cmzoo.org
Colleen Lynch	COLUMBIA - Riverbanks Zoological Park, Columbia, SC	clynch@riverbanks.org
Harrison Edell	DALLAS - Dallas Zoo, Dallas, TX	harrison.edell@dallaszoo.com
Daryl Richardson	DALLAS WA - Dallas World Aquarium, Dallas, TX	daryl@dwazoo.com
Chelle Plasse	DISNEY AK - Disney's Animal Kingdom, Bay Lake, FL	Chelle.Plasse@disney.com
Jan Steele	DREHER PA - Palm Beach Zoo at Dreher Park, West Palm Beach, FL	jsteele@palmbeachzoo.org
Jacquelyn M. Fallon	DULUTH – Lake Superior Zoo, Duluth, MN	jfallon@lszoo.org
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Michael Maxcy	LOSANGELE – Los Angeles Zoo & Botanical Gardens, Los Angeles, CA	Mike.maxcy@lacity.org
Celia Falzone	LUFKIN - Ellen Trout Zoo, Lufkin, TX	CFalzone@ellentroutzoo.com
Phung Luu	LUU P – Animal Behavior & Conservation Connections, LLC. Wilmington, DE	ptluu@msn.com
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Joe DeGraauw	NASHV ZOO - Nashville Zoo at Grassmere, Nashville, TN	jdegraauw@nashvillezoo.org
David Oehler	NY BRONX - Bronx Zoo/Wildlife Conservation Society, Bronx, NY	doehler@wcs.org
Sara Hallager	NZP-WASH - Smithsonian National Zoological Park, Washington, DC	hallagers@si.edu

Contact Name (IR)	Institution	Email
Stephanie Heuttner	OMAHA - Omaha's Henry Doorly Zoo, Omaha, NE	stephanieh@omahazoo.com
Michael Boos	ORLANDO - Sea World Orlando, Orlando, FL	michael.boos@Seaworld.com
Cindy Norton	PARAMUS - Bergen County Zoological Park, Paramus, NJ	cnorton@co.bergen.nj.us
Marina Haynes	PHILADELP - The Philadelphia Zoo, Philadelphia, PA	Haynes.Marina@PhillyZoo.org
John Sills	PHOENIX - Phoenix Zoo, Phoenix, AZ	JSills@phoenixzoo.org
Kurt Hundgen	NATAVPGH - National Aviary in Pittsburgh, Pittsburgh, PA	kurt.hundgen@aviary.org
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Ian Shelley	SALISBURY - Salisbury Zoological Park, Salisbury, MD	ishelley@ci.salisbury.md.us
Josef San Miguel	SAN ANTON - San Antonio Zoological Gardens & Aqua, San Antonio, TX	josef.sanmiguel@sazoo.org
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