Population Management Overview

Jodi Neely Wiley
North Carolina Zoo
Hamadryas Baboon
Studbook Keeper
and SSP Coordinator
Studbooks include the pedigree and location history of the population in a database that provides the basis for the detailed genetic and demographic analyses used for management of captive animal populations.

Studbooks may either be regional (e.g., North American) or international in scope.

Studbook taxa are selected through the regional collection planning process of AZA's TAGs.
New Studbook Program Designations

Green SSP Studbook Program
• Population is currently sustainable for the long term
• Able to maintain >90% gene diversity for 100 years

Yellow SSP Studbook Program
• Population unable to maintain >90% gene diversity for 100 years

Red SSP Studbook Program
• The population is not currently sustainable
• Fewer than 50 individuals
• Adherence to SSP is voluntary
How do you become a studbook keeper?

- Studbook Position must be vacant
- Must be an AZA member
- Needs to be an “expert” on the specific species
How do you become a studbook keeper?

- Institutional support
- Participate in TAG (Taxon Advisory Group) meetings
- Must take Population Management I course
- Apply
Sparks- DOS format

- The 1\textsuperscript{st} program used for studbooks and can be used for international studbooks
PopLink- the newer program
  - More user friendly
Reports Generated from PopLink
Studbooks must be published every 3 years
Preparing for Master Planning Session

Create/Update Studbook

- Information gathered from Taxon reports and specimen reports
  - Registrars
  - Institutional Representatives
  - Isis

![Taxon Report Papio hamadryas](image-url)
Surveys

- Send out surveys to holding institutions annually
- Ask for specimen reports
- Any special concerns or requests?

Hamadryas Baboon Questionnaire
November 2009

Institution Name________________________________________________________

Institutional Representative for:

Hamadryas Baboon

Phone Number:_________________________________________________________
E-mail Address:________________________________________________________
Fax Number:__________________________________________________________

Number of animals currently housed at your location:____________________

Please list Studbook ID Numbers of individuals housed at your facility:

We are currently housing (non-breeding) _______.

We are currently breeding _______ Hamadryas Baboons.

We would like to place _______ Hamadryas Baboons. Please give ID number of individuals:

_________________________ __________________________

We would like to acquire _______ Hamadryas Baboons.

Would you like to participate in the breeding of this species?___________

Would you be willing to hold single-sex groups?___________

Maximum number of Hamadryas Baboons that you can house__________

Any special concerns or considerations?

Return completed form by 15 November 2009:
Jodi Neely Wiley - North Carolina Zoo - 4401 Zoo Parkway - Asheboro, North Carolina 27205
or jodi.wiley@nczoo.org
Master Planning for the Species

- Typically try to Master plan every 2-3 years
- Meet with PMC (Population Management Center)
- Run data base to determine best possible pairings to keep genetic diversity in the species.
Recommendations made for:

- Breeding
- Transfers
- Companionship
Breeding recommendations made between Masterplanning Sessions-Mate Rx

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Reproductive planning:

For the population to remain stable, approximately 2 births are required per year.

For the population to increase from 41 individuals to 45 individuals over the next three years, 3-4 births are needed per year.

For the population to increase from 41 individuals to 45 individuals over the next year, about 6 births are needed.

Presently, the best breeding pairs that do not require transfers, are highlighted in yellow.
Keepers as Population Managers

- Good Communicator
- Must be an “expert” on the species you manage and able to answer questions from other institutions on husbandry, introduction methods, behavioral issues, etc.
- Can be time consuming and may have to use personal time (on average ~5 hours per week answering emails, phone conferences, updating studbook, etc)
Population Managers working with Keepers

- Keepers are experts on their specific animals and are a great resource
  - Husbandry
  - Behavior
  - Conservation
A Crash Course in Masterplanning

Presented by: Randy Fulk- Education Curator NC Zoo
Material Provided by:

The Population Management Center

&

North Carolina Zoo
Small Populations

Vulnerable to Stochastic Events

Demographically Unstable

Loss of Genetic Diversity
Potential mates can be few and far between
Genetics

Population Genetics – study of genetic traits in a population and how the frequencies of traits change from one generation to the next.
Genetic Diversity
keep as much genetic variety as possible
by managing mean kinship and inbreeding

Mean Kinship
= average relatedness to everyone else in the population
⇒ breed animals with lowest mean kinships

Inbreeding
avoid breeding close relatives
GENETICS 101

Gene Diversity

Our goal is to keep gene diversity at or above 90%

the average mammal SSP has 93% GD

(in other words, the captive population has 93% of the genetic variation of the wild population from which they came)

Gene diversity is lost from one generation to the next

An individual cannot pass on all of its traits to its offspring; some traits will be lost

Our job is to slow this loss...
Kinship
Mean kinship = 0.000 + 0.0195 + 0.0098 + 0.0125 + 0.000 + 0.25 = 0.049
GENETICS 101

Descendant Mean Kinship
GENETICS 101

How do we use Mean Kinship?

We choose individuals with low mean kinships to make the most desirable breeding pairs.
Inbreeding Reduces Diversity

Dad X Mom

4 Kids

Inbred grandkid
Inbreeding can be **Depressing**

- Juvenile survival
- Adult survival
- Mate acquisition
- Social dominance
- Fertility and Fecundity
- Growth
Basic Truths About Genetics

Genetically diverse populations survive longer

Small populations always loose genetic diversity (GD) over generations

Rare alleles are lost first

Shorter generation times lead to more rapid loss of GD

Unequal family sizes reduce GD
Demography

The study of population statistics – births and deaths and everything in between.
Demography

Numbers, numbers, numbers...

- number of animals
- number of males
- number of females
- number of young animals
- number of old animals
- number of reproducing animals
- number of non-reproducing animals
- number of births
- number of deaths
DEMOGRAPHY 101

Age Distribution

- AGE CLASS
- NUMBER OF INDIVIDUALS

Males = 70
Females = 64
## Life Tables

**Males: Actual Data**

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**Estimates:**
- $r = 0.0769$
- $\lambda = 1.0799$
- $T = 5.90$
- $N = 43.00$
- $N_{20\text{ yrs}} = 200.12$

**Males: Model Data**

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**Estimates:**
- $r = 0.0769$
- $\lambda = 1.0799$
- $T = 5.90$
- $N = 43.00$
- $N_{20\text{ yrs}} = 200.12$

These data have been smoothed 0x

Click here to smooth the data once more
Population Growth Projections

- **Actual** growth is shown in blue.
- **Stable** growth is shown in red.

The graph shows that the population size increases over time, with the stable population growing faster than the actual population.
MASTERPLAN

Genetics <-> Husbandry

Demography
Basic Strategies

Start with sufficient numbers of founders

Expand the population as quickly as possible to its carrying capacity

Stabilize the population at its carrying capacity
Basic Strategies

Equalize family sizes/founder representation

Extend generation time as much as possible

Subdivide the population

Use available repro technology to best advantage
SSP Central Dogma

1st Priority:
Breed individuals with lowest MK

Most underrepresented

Possess the rarest alleles
SSP Central Dogma

2nd Priority

Breed individuals whose alleles may be lost soon

Age

Health

Reproductive Condition
You need to...

Receive clean studbook from RSDMC
Export data and create PM2000 project
Review demographic information
Plan the number of pairs
Select the animals in the breeding population
Review genetic results
Make your breeding pairs
Write a draft and distribute for comment
Incorporate comments into final report
Copy, collate, bind, stuff envelopes, mail, and post on the internet
Repeat next year!