

# **Management of Lorises in Captivity**

## **A Husbandry Manual for Asian Lorisines**

*(Nycticebus & Loris ssp.)*

**Edited by:**  
**Helena Fitch-Snyder and Helga Schulze**



Copyright for background map:  
Geo-Space, Austria

**Compiler: Lena C. Larson**  
**Illustrations: Helga Schulze**

**Published by the Center for Reproduction of Endangered Species (CRES)**  
**Zoological Society of San Diego**

**©2001**

## **AUTHORS**

Lisa Bottcher-Law, Woodland Park Zoological Gardens, 5500 Phinney Avenue North, Seattle, WA 98103-5897

Helena Fitch-Snyder, Center for Reproduction of Endangered Species (CRES) Zoological Society of San Diego, P.O. Box 120551, San Diego, CA 92112-0551

Janet Hawes, Zoological Society of San Diego, P.O. Box 120551, San Diego, CA 92112-0551

Lena Larsson, Center for Reproduction of Endangered Species (CRES) Zoological Society of San Diego, P.O. Box 120551, San Diego, CA 92112-0551

Barbara Lester, Houston Zoological Gardens, 1513 North MacGregor, Houston, TX 77030-1603

Jackie Ogden, Ph.D., Disney's Animal Kingdom, 3281 Sherberth Road, Kissimmee, FL 34747

Helga Schulze, Department for Neuroanatomy, Ruhr-University, MA 6/161 b, D-44780, Bochum, Germany

Kerri Slifka, Brookfield Zoo, 3300 S. Golf Road, Brookfield, IL 60513-1099

Ilse Stalis, D.V.M., Zoological Society of San Diego, P.O. Box 120551, San Diego, CA 92112-0551

Meg Sutherland-Smith, D.V.M., Zoological Society of San Diego, P.O. Box 120551, San Diego, CA 92112-0551

Barbara Toddes, Philadelphia Zoological Garden, 3400 West Girard Avenue, Philadelphia, PA 19104-1196



## ACKNOWLEDGMENTS

This husbandry manual has been made possible through the assistance of the many people over the past several years who helped write, compile, edit, and otherwise contribute to this publication. Among those who assisted with the manuscript and are not acknowledged elsewhere include: Joe Bussiere, Hanifa Ysaguirre, Danica Reine, Jane Ruddick, Noelle Tornatore, and Sai Ly. Karen Worley, Marissa Sorbelo, and Darlene Rosemary provided invaluable technical editing services. Barry Fass-Holmes assisted with several of the graphs.

The editors thank Fiona Anne Fisher, editor of *International Zoo Yearbook*, for permission to use information from publication (Schulze 1998). Dr. Plesker, of Paul Ehrlich Institute (Langen), made new postmortum examinations on *Lorises* and allowed use and quotations of unpublished information.

Janet Hawes and Jacqueline Ogden express their appreciation to Dr. Donna Iallegio, Philadelphia Zoological Society, for her detailed review of an earlier copy of their manuscript. Helpful information was also provided by Bernhard Meier and Helga Schulze, Ruhr-University Bochum; the Duke University Primate Center; and Ewa Trzesowka, Ogród Zoologiczny.

Meg Sutherland-Smith and Ilse Stalis thank Drs. David Sutton and Patricia Feeser from the Duke University Primate Center, who provided information for their section. The data were compiled while David Sutton was a visiting veterinary student from Cambridge, England. They would also like to thank Dr. Andy Teare for providing the clinical pathology data from ISIS, and they are grateful to Helga Schulze (Ruhr-Universität Bochum, Bochum, Germany) for providing information for *Loris tardigradus*.

The satellite map, a part of which is pictured in the front cover figure, can be obtained from: Geo-Space, Jacob-Haringer-Str. Nr. 1, 5020 Salzburg, Austria

The funding for publication costs was generously provided by the Ocelots, a support group of the Zoological Society of San Diego.



## INTRODUCTION

The purpose of this manual is to provide basic husbandry guidelines to loris managers, caretakers, and veterinarians. The information in this manual has been compiled from numerous articles, reports, and personal experiences by the authors and editors. Because new information is continuously being discovered, it is tempting to keep delaying publication until the husbandry manual is even more complete. However, as an increasing number of institutions become involved with the management of these specialized prosimians, it has become essential to have this information available in a usable format.

When the pygmy loris was first introduced to the Western Hemisphere a little over a decade ago, its basic biology and husbandry requirements were virtually unknown. Pygmy loris management techniques were derived from methods that had previously been developed for slow and slender lorises. Researchers and managers are just beginning to understand some of the characteristics that make the pygmy loris unique.

The three loris types each have unique characteristics that are species specific. However, because they share many of the same management methods, housing conditions, and behavioral characteristics, the editors decided that information about all the three loris species should be included in this volume.

In 1995, The Pygmy Loris Species Survival Plan (SSP) was established through the American Association of Zoos and Aquariums (AZA). One of the goals of this group is to develop a self-sustaining captive population of this species. Along with the Pygmy Loris Masterplan (Fitch-Snyder, 1998), this husbandry manual is intended as a tool to assist toward this goal.

The editors plan to periodically distribute updated and new information to SSP Institution Representatives and other appropriate recipients. Users of this publication are encouraged to maintain this manual as a working document and contribute additional material for future updates.

Helga Schulze is compiling additional information, particularly for slender loris husbandry (see also Schulze, 1998); readers who are interested can contact her directly via e-mail ([helga.schulze@cityweb.de](mailto:helga.schulze@cityweb.de)) or at her University address, which is listed in the authors section of this publication.

In addition to printed materials, some loris information is available via the Internet. Here, new data and amendments to printed information may be published in the future. Two addresses, as an example: Loris homepage by Dr. K. I. Anna Nekaris, Assistant Professor, Department of Anthropology, Southern Illinois University; address: <http://www.nocturnalprimate.org>. In <http://www.species.net>, a web site of Quantum Conservation for husbandry and conservation information (by Richard Perron), a loris conservation database is under construction (compiler: Helga Schulze; direct address: <http://www.species.net/Primates/Loris/index.htm>).

Helena Fitch-Snyder



## **TABLE OF CONTENTS**

<b>TAXONOMY AND DESCRIPTION</b> .....	1
<b>DISTRIBUTION AND STATUS</b> .....	7
<b>HISTORY OF LORISES IN CAPTIVITY</b> .....	13
<b>BEHAVIOR</b> .....	14
Introduction .....	14
Social Behavior .....	14
Housing and Social Behavior .....	15
Aggressive Behavior .....	16
Loris Ethogram .....	18
<b>REPRODUCTION</b> .....	28
Determining Gender .....	28
Adolescent Development .....	29
Estrous Cycles .....	30
Gonadal Morphology in Males .....	30
Copulation .....	32
Gestation .....	33
Parturition .....	33
Reaction of Others to Newborns .....	34
Resumption of Estrus .....	35
Interbirth Interval .....	35
Reproductive Seasonality .....	36
Litter Size .....	38
Infant Development and Parental Behavior .....	39
Captive Reproductive History .....	41
<b>INFANT CARE</b> .....	45
Birth Management and Hand Rearing	
—contributed by Janet Hawes and Jacqueline Ogden. ....	45
Hand Rearing .....	45
Post-Partum Observations and Evaluation .....	45
Alternatives to Hand Rearing .....	45
Physical Needs .....	46
Physical Needs: Species-Specific Concerns .....	49
Social Needs .....	50
<b>DIET</b> .....	52
Diet Composition in the Wild .....	52
Diet Composition in Captivity .....	53
Diet Composition in Captivity for the Pygmy Loris	
—contributed by Barbara Toddes and Kerri Slifka .....	55
<b>HEALTH</b> .....	60
Review of Loris Clinical Information and Pathology Data from the San Diego Zoo: 1982-1995	
—contributed by Meg Sutherland Smith, D.V.M. and Ilse Stalis, D.V.M. ....	60
Introduction .....	60

Preventive Medicine .....	60
Anesthesia .....	60
Clinical Pathology .....	61
Medical Review .....	61
Summary .....	65
Tables .....	66
<b>HABITAT DESIGN</b> .....	71
Minimum Standards for Housing Asian Lorisesines	
( <i>Adapted from AZA guidelines for the Family Lorisidae</i> )—contributed by Lisa Bottcher-Law .....	71
General Habitat Design .....	72
Temperature Levels .....	78
Lighting Conditions .....	78
Cleaning Cages .....	79
An Enriched Environment	
—contributed by Lisa Bottcher-Law .....	80
Mixed Species Housing	
—contributed by Barbara Lester .....	88
<b>LITERATURE CITED</b> .....	93
MAP REFERENCES .....	102
<i>N. coucang</i> distribution map (Figure 9) .....	102
<i>N. pygmaeus</i> distribution map (Figure 10) .....	103
Loris distribution maps (Figure 11) .....	104
<i>Loris Husbandry Manual</i>	



## LIST OF TABLES

	Page
Table 1: Taxonomy of the Asian lorises .....	1
Table 2: Subspecies of the slow loris .....	5
Table 3: Forms of the pygmy loris .....	5
Table 4: Subspecies of the slender loris .....	6
Table 5: Parental age at time of birth of first offspring .....	30
Table 6: Interbirth intervals .....	36
Table 7: Age specific fertility rates .....	43
Table 8: Mean number of litters .....	43
Table 9: Litter production by adults .....	44
Table 10: Scale of maternal care .....	46
Table 11: Infant diet schedule .....	48
Table 12: Infant formula schedule .....	49
Table 13: Sample reintroduction schedule .....	51
Table 14: The diet of <i>N. coucang</i> at Sungai Tekam .....	52
Table 15: Identified food items in the diet of <i>N. coucang</i> .....	52
Table 16: Nutritional information from Ruhr-University Bochum for slender lorises .....	54
Table 17: Daily diet of lorises .....	54
Table 18: Nutrient density .....	58
Table 19: Nutrient requirements .....	59
Table 20: Anesthetic agents used in three loris species .....	61
Table 21: Population demographics for loris species reviewed .....	61
Table 22: Mortality in <i>Nycticebus coucang</i> at the Duke Primate Center .....	66
Table 23: Mortality in <i>Nycticebus pygmaeus</i> at the Duke Primate Center .....	66
Table 24: Mortality in <i>Loris tardigradus</i> at the Duke Primate Center .....	66
Table 25: ISIS Clinical Pathology Reference Ranges in Slow Loris .....	67
Table 26: ISIS Clinical Pathology Reference Ranges in Pygmy Loris .....	68
Table 27: ISIS Clinical Pathology Reference Ranges in Slender Loris .....	69
Table 28: Enrichment log .....	83
Table 29: Browse list .....	86
Table 30: Specialty foods .....	87
Table 31: Species that have been successfully kept with pygmy lorises .....	90
Table 32: Species that have been successfully kept with slow lorises .....	91
Table 33: Species that have been successfully kept with slender lorises .....	92

## LIST OF FIGURES

	Page
Figure 1: Genus <i>Nycticebus</i> .....	1, 2
Figure 2: Genus <i>Loris</i> .....	2
Figure 3: Genus <i>Arctocebus</i> .....	2
Figure 4: Genus <i>Perodicticus</i> .....	3
Figure 5: Length of nuchal spines in <i>Perodicticus potto</i> .....	3
Figure 6: Anatomy of the hand in Loris .....	3
Figure 7: Some structures in the mouth of <i>Loris tardigradus</i> .....	3
Figure 8: Some skin glands found in prosimian primates .....	4
Figure 9: Distribution area and specimen localities of <i>N. coucang</i> .....	7
Figure 10: Distribution area and specimen localities of <i>N. pygmaeus</i> .....	9
Figure 11: Distribution of slender loris subspecies in India .....	10
Figure 12: Distribution of slender loris subspecies in Sri Lanka .....	11
Figure 13: Discrimination of sex in lorises .....	28
Figure 14: Signs of estrus in lorises and pottos .....	31
Figure 15: Female <i>N. coucang</i> licking infant and eating placenta .....	33
Figure 16: <i>L.t. nordicus</i> parturition .....	34
Figure 17: Slow Loris - number of births per month .....	37
Figure 18: Pygmy Loris - number of births per month .....	37
Figure 19: Slender Loris - number of births per month .....	38
Figure 20: The early developmental stages of a slender loris .....	40
Figure 21: Slow Loris births in North America 1951-1998 .....	41
Figure 22: Pygmy Loris births in North America 1986-1994 .....	42
Figure 23: Slender Loris births in North America 1963-1994 .....	42
Figure 24: Mean number of litters produced by successful breeders .....	44
Figure 25: Female <i>N. pygmaeus</i> with twins .....	51
Figure 26: Anatomy of Slender Loris .....	70
Figure 27: Skeletal structure of Slender Loris .....	70
Figure 28: Skull morphology of Slender Loris .....	70
Figure 29: Examples of an adequately furnished cage for slender & slow lorises .....	74
Figure 30: Choice of sleeping places and meaning of different sleeping postures .....	76
Figure 31: Substrate use by captive Slender Loris .....	77