FIELDIANA

Zoology

NEW SERIES, NO. 96

FIELD MUSEUM LIBRARY
OCT 11 2000

Systematic Review of the Rhesus Macaque, *Macaca mulatta* (Zimmermann, 1780)

Jack Fooden

June 30, 2000
Publication 1509

PUBLISHED BY FIELD MUSEUM OF NATURAL HISTORY

Information for Contributors to Fieldiana

General: *Fieldiana* is primarily a journal for Field Museum staff members and research associates although manuscripts from nonaffiliated authors may be considered as space permits.

The Journal carries a page charge of $65.00 per printed page or fraction thereof. Payment of at least 50% of page charges publishes a paper for expedited processing which reduces the publication time. Contributions from staff, research associates, and invited authors will be considered for publication regardless of ability to pay page charges; however the full charge is mandatory for nonaffiliated authors of unsolicited manuscripts. Three complete copies of the text (including title page and abstract) and of the illustrations should be submitted (one original copy plus two review copies which may be machine copies). No manuscripts will be considered for publication or submitted to reviewers before all materials are complete and in the hands of the Scientific Editor.

Manuscripts should be submitted to Scientific Editor, *Fieldiana*, Field Museum of Natural History, Chicago, Illinois 60605-2496, U.S.A.

Text: Manuscripts must be typewritten double-spaced on standard weight, 8½- by 11-inch paper with wide margins on all four sides. If typed on an IBM-compatible computer using MS-DOS, also submit text on 5¼-inch diskette (WordPerfect 4.1, 4.2, or 5.0, MultiMate, Displaywrite 2, 3 & 4, Wang PC, Samna, Microsoft Word, Volkswriter, or WordStar programs or ASCII).

For papers over 100 manuscript pages, authors are requested to submit a "Table of Contents," a "List of Illustrations," and a "List of Tables" immediately following title page. In most cases, the text should be preceded by an "Abstract" and should conclude with "Acknowledgments" (if any) and "Literature Cited."

All measurements should be in the metric system (periods are not used after abbreviated measurements). The format and style of headings should follow that of recent issues of *Fieldiana*.

For more detailed style information see *The Chicago Manual of Style* (13th ed.), published by The University of Chicago Press, and also recent issues of *Fieldiana*.

References: In "Literature Cited," book and journal titles should be given in full. Where abbreviations are desirable (e.g., in citation of synonymies), authors' *consistently* should follow *Botanico-Periodicum-Huntianum* and *Taxonomic Literature* by F. A. Stafleu & R. S. Cowan (1976 *et seq.*) (botanical papers) or *Serial Sources for the Biosis Data Base* (1983) published by the BioSciences Information Service. Names of botanical authors should follow the "Draft Index of Author Abbreviations, Royal Botanic Gardens, Kew," 1984 edition, or *TL-2*.

References should be typed in the following form:

Croat, T. B. 1978. Flora of Barro Colorado Island. Stanford University Press, Stanford, Calif., 943 pp.

Gentry, P. J., J. R. Lloyd and I. D. Pennington. 1963. A comparison of montane and lowland rain forest in Ecuador. I. The forest structure, physiognomy, and floristics. Journal of Ecology, **51**: 567–601.

Lathrop, E. J. M. 1979. Yaqui among the Stona: Cultural patterns in visions, pp. 63–80. In Brosman, D. L. and R. A. Schwarz, eds., Spirits, Shamans, and Stars. Mouton Publishers, The Hague, Netherlands.

Metraux, J. 1946. The historic tribes of Ecuador, pp. 785–821. In Steward, J. H., ed., Handbook of South American Indians, Vol. 2, The Andean Civilizations. Bulletin 143, Bureau of American Ethnology, Smithsonian Institution, Washington, D.C.

Stolze, R. C. 1981. Ferns and fern allies of Guatemala. Part II. Polypodiaceae. Fieldiana: Botany, n.s., 6: 1–522.

Illustrations: Illustrations are referred to as "figures" in the text (but as "plates"). Figures must be accompanied by some indication of scale, normally a reference bar. Statements in figure captions, "×0.5," are not acceptable. Captions should be typed double-spaced and consecutively. See recent issues of *Fieldiana* for details of style.

All illustrations should be marked on the reverse with author's name, figure number(s), and "top."

Figures as submitted should, wherever practicable, be 8½ by 11 inches (22 × 28 cm) and not exceed 11½ by 16½ inches (30 × 42 cm). Illustrations should be mounted on boards in the arrangement to be obtained in the printed work. The original art should be suitable for transmission by the process as follows: Pen and ink drawings must be original; photographic enlarged drawings must be originals but within the size limitations and sharp; and must be high-quality, glossy, black and white prints. Original illustrations will be returned to the corresponding author upon publication unless otherwise specified.

Authors who wish to publish figures that require costly special paper or color reproduction must make arrangements with the Scientific Editor.

Page Proofs: *Fieldiana* employs a two-copy correction system. The correspondence author will normally receive a typeset (edited manuscript) on which additional alterations and changes can be made but queries answered. Only one set of page proofs will be sent. All alterations (corrections of type must be made on the author's set of page proofs. Changes in page proofs (as opposed to corrections) are very expensive. Author-generated changes in page proofs can only be made at the author's expense as charges for them.

This paper meets the requirements of ANSI/NISO Z39.48-1992 (Permanence of Paper).

FIELDIANA

Zoology
NEW SERIES, NO. 96

FIELD MUSEUM LIBRARY

Systematic Review of the Rhesus Macaque, *Macaca mulatta* (Zimmermann, 1780)

Jack Fooden

Division of Mammals
Department of Zoology
Field Museum of Natural History
1400 South Lake Shore Drive
Chicago, Illinois 60605-2496
U.S.A.

Accepted June 10, 1999
Published June 30, 2000
Publication 1509

PUBLISHED BY FIELD MUSEUM OF NATURAL HISTORY

© 2000 Field Museum of Natural History
ISSN 0015-0754
PRINTED IN THE UNITED STATES OF AMERICA

Table of Contents

Abstract 1
Introduction 1
Geographic Distribution and Current Population Estimates 2
Pelage 7
General Characterization 7
Early Development 7
Seasonal Variation 11
Geographic Variation 16
Nepalese Standards 16
Survey of Sample Areas 16
Summary 25
External Measurements and Proportions 26
Sex and Age Variation 26
Geographic Variation 26
Head and Body Length 26
Tail Length 29
Relative Tail Length 29
Body Weight 30
Cranial Characters 38
Sex and Age Variation 38
Geographic Variation 39
Skull Length 39
Cranial and Dental Morphology 42
Comparison with *Macaca fascicularis* 44
Molecular Biology and Genetics 44
Mitochondrial DNA 44
Nuclear DNA 52
Blood Proteins 52
Karyology 52
Physiology and Disease 53
Blood, Cerebrospinal Fluid, and Temperament 53
Lead Content of Molars 53
Malaria 53
Viral Infections 54
Natural History 54
Habitats 54
Arboreality/Terrestriality 54
Swimming 56
Group Size and Composition 56
Home Range, Day Range 57
Population Density 57
Diet 57
Predators 61
Intergroup Behavior 62
Interspecific Behavior 66
Intrageneric 66
Intergeneric 68
Reproduction 68
Seasonality 68
Sexual Maturation 70
Sexual Skin 71
Menstrual Cycle 71
Estrus 71
Consortship 72
Copulatory Behavior 72
Dominance Rank and Reproductive Success 73
Inbreeding 73
Nonreproductive Sexual Behavior 74
Gestation Length 74
Parturition 74
Birth Weight, Infant Sex Ratio 75
Birth Rate, Infant Mortality Rate 75
Nursing, Weaning 76
Menopause 77
Annual Mortality Rate 78
Population Growth Rate 78
Fossils and Subfossils 79
Systematics 79
Geographic Variation and Subspecific Recognition 79
Size 79
Tail Length 81
Pelage 81
Molecular Diversity 82
Synonymy 83
Type 86
Type Locality 86
Evolution and Dispersal 87
Acknowledgments 89
Literature Cited 90
Note Added in Proof 120
Appendix 1: Specimens Examined 121
Appendix 2: Gazetteer of *Macaca mulatta* Localities 124
Index 179

List of Illustrations

1. Known locality records of *Macaca mulatta* 2
2. Detail maps of *Macaca mulatta* localities
   A. Western section 4
   B. Central section 8
   C. Eastern section 12
3. Dorsal pelage color in *Macaca mulatta*
   A. Topotype 17
   B. Contrasting pelage color in two adult males collected 4 days apart at Rajapara, India 17

List of Tables

1. Estimated population of *Macaca mulatta* in five countries for which data are available 3
2. External measurements and proportions in age/sex classes of wild-collected *Macaca mulatta* 30
3. Geographic variation in head and body length in adult *Macaca mulatta* 31
4. Geographic variation in tail length in adult *Macaca mulatta* 33
5. Geographic variation in relative tail length in adult *Macaca mulatta* 37
6. Dry-skin measurements of 14 *Macaca mulatta* specimens collected at Xinglong Xian (= Eastern Tombs), Hebei Province, northeastern China 39
7. Geographic variation of body weight in adult *Macaca mulatta* 40
8. Cranial measurements and proportions in age/sex classes of wild-collected *Macaca mulatta* 44
9. Geographic variation in greatest length of skull in adult *Macaca mulatta* 46
10. Frequencies of major alleles at polymorphic blood-protein loci in samples of *Macaca mulatta* from six countries 53
11. Habitats reported for *Macaca mulatta* ... 55
12. Frequency distribution of elevation records of *Macaca mulatta* 56
13. Arboreal/terrestrial behavior recorded during daylight hours in samples of *Macaca mulatta* 56
14. Group size reported for *Macaca mulatta* 58
15. Ratio of sexually mature males to sexually mature females reported in groups of *Macaca mulatta* 60
16. Home range area reported for groups of *Macaca mulatta* 61
17. Day range reported for groups of *Macaca mulatta* 62
18. Population density reported for *Macaca mulatta* 63
19. Foods reported eaten by *Macaca mulatta*. Dietary proportions are indicated where data are available 64
4. Monthly incidence of prime, faded, and molting pelage stages in wild-collected specimens of *Macaca mulatta* 18
5. Sample areas cited in *Macaca mulatta* pelage comparisons 20
6. Latitudinal variation in interscapular hair length in *Macaca mulatta* adults 27
7. Latitudinal variation in midtail hair length in *Macaca mulatta* adults 28
8. Latitudinal variation in head and body length in *Macaca mulatta* adult noncaptives 32
9. Latitudinal variation in tail length in *Macaca mulatta* adult noncaptives 34
10. Longitudinal variation in tail length in *Macaca mulatta* adult noncaptives 35
11. Latitudinal variation in relative tail length in *Macaca mulatta* adult noncaptives 36
12. Longitudinal variation in relative tail length in *Macaca mulatta* adult noncaptives 38
13. Latitudinal variation in body weight in *Macaca mulatta* adult noncaptives 41
14. Skull of adult female *Macaca mulatta*—FMNH 99668, Thailand: Ban Mae Lamao 42
15. Skull of adult male *Macaca mulatta*—FMNH 99669, Thailand: Huai Ap Nang 43
16. Dental emergence chronology in *Macaca mulatta* 45
17. Latitudinal variation in greatest length of skull in *Macaca mulatta* adult noncaptives 47
18. Longitudinal variation in greatest length of skull in *Macaca mulatta* adult noncaptives 48
19. Sample areas cited in mitochondrial DNA study of Zhang and Shi 50
20. Consensus dendrogram of mitochondrial DNA relationships in *Macaca mulatta* samples studied by Zhang and Shi 51
21. Type localities of nominal species or subspecies allocated to *Macaca mulatta*; known limits of natural distribution of *Macaca mulatta* also indicated 82
22. Hypothetical stages in the evolution and dispersal of *Macaca mulatta* 88

20. Daily waking-hour time budget estimates for *Macaca mulatta* 66
21. Intergroup contact behavior reported for *Macaca mulatta* 67
22. Mating and birth periods reported for natural populations of *Macaca mulatta* 69
23. Age of sexual maturity reported for natural populations of *Macaca mulatta* 70
24. Birth weight in laboratory-housed *Macaca mulatta* 75
25. Infant sex ratio in *Macaca mulatta* 76
26. Annual birth rate in natural populations of *Macaca mulatta* 77
27. Infant mortality rate in natural populations of *Macaca mulatta* 78
28. Population growth rate in *Macaca mulatta* 80
29. Localities and ages of *Macaca mulatta* fossils or subfossils 81
30. Subspecies recognized in published classifications of *Macaca mulatta*, 1932–95 83
31. Latitudinal range and relative tail length in *fascicularis*-group species of macaques 89

Systematic Review of the Rhesus Macaque, *Macaca mulatta* (Zimmermann, 1780)

Jack Fooden

Abstract

The rhesus macaque, *Macaca mulatta* (Zimmermann, 1780), is systematically reviewed, based on examination of 638 museum specimens, observation of natural populations, and survey of relevant literature. The natural distribution of *M. mulatta* extends from eastern Afghanistan and western India to eastern China and northern Vietnam. This review includes analyses of geographic variation in pelage characters, external measurements and proportions, cranial characters, molecular biology and genetics, and physiology and disease. Information also is presented concerning natural history, reproduction, and paleontology. Taxonomically, local and regional populations are regarded as inadequately differentiated to warrant recognition of subspecies in *M. mulatta*. A hypothesis is proposed to explain the evolution and dispersal of this species. In an appendix, an annotated gazetteer lists 1,239 localities where *M. mulatta* has been collected or observed.

Introduction

The rhesus macaque, *Macaca mulatta* (Zimmermann, 1780), probably is the most intensively studied species of non-human primate (see, e.g., Primate Information Center, 1998, p. 27). The present systematic review of *M. mulatta* is based on examination of 638 museum specimens (Appendix 1); observation of natural populations in India, Thailand, and China; and survey of relevant literature. The principal subjects covered in this review are geographic variation in characters; natural history, reproduction, and paleontology; taxonomy; and evolution and dispersal. Specimens examined are preserved in the following institutions (number of specimens in parentheses), which hereafter are cited by means of the indicated abbreviations:

AMNH	American Museum of Natural History, New York (53)
ANSP	Academy of Natural Sciences, Philadelphia (8)
BMNH	Beijing Museum of Natural History, Beijing (7)
BM(NH)	British Museum (Natural History), London (122)
BNHS	Bombay Natural History Society, Mumbai (39)
CTNRC	Centre for Thai National Reference Collections, Thailand Institute of Scientific and Technological Research, Bangkok (1)
FCXM	Forestry College of Vietnam, Xuan Mai (5)
FDCG	Forestry Designing Centre of Guangxi, Nanning (8)
FMNH	Field Museum of Natural History, Chicago (23)
FUBD	Fudan University, Biology Department, Shanghai (2)
HUBD	Hangzhou University, Biology Department, Hangzhou (1)
IEBR	Institute of Ecology and Biological Resources, Hanoi (38)
IRSN	Institut Royal des Sciences Naturelles de Belgique, Brussels (3)
IZCAS	Institute of Zoology, Chinese Academy of Sciences, Beijing (47)
KIZ	Kunming Institute of Zoology, Chinese Academy of Sciences, Kunming (28)
MCZ	Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts (8)

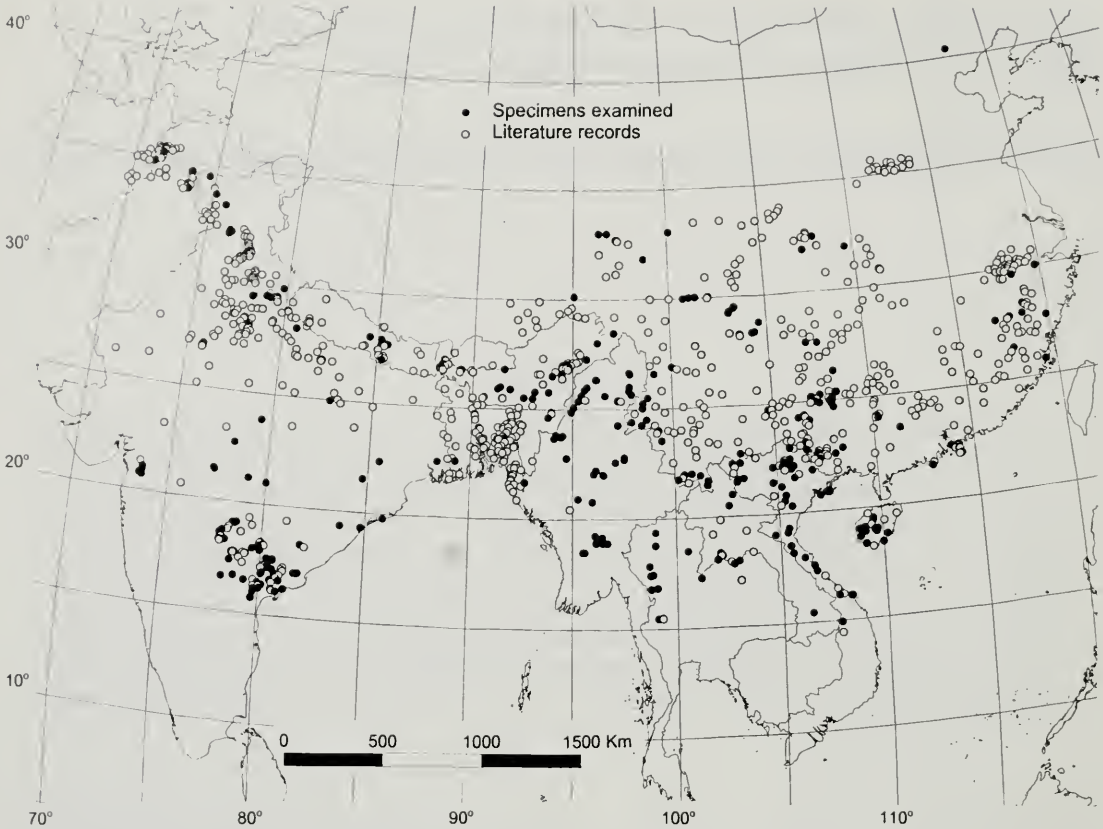

FIG. 1. Known locality records of *Macaca mulatta*; specimens examined include living monkeys personally observed in the field. For details, see Figures 2A–C.

MZB	Museum Zoologicum Bogoriense, Bogor (1)
MNHN	Muséum National d'Histoire Naturelle (Mammifères), Paris (15)
NHMB	Naturhistorisches Museum, Basel (2)
NWPIB	Northwest Plateau Institute of Biology, Chinese Academy of Sciences, Xining (6)
P-CM	Powell-Cotton Museum, Birchington, Kent (2)
RMNH	National Museum of Natural History, Leiden (2)
SCIEA	South China Institute of Endangered Animals, Guangzhou (23)
SIZ	Shaanxi Institute of Zoology, Xi'an (4)
SMNH	Shanghai Museum of Natural History, Shanghai (54)
UPS	University of Puget Sound, Tacoma (1)
USNM	National Museum of Natural History, Washington, D.C. (39)
ZMB	Zoologisches Museum des Humboldt-Universität, Berlin (6)
ZMNH	Zhejiang Museum of Natural History, Hangzhou (2)
ZMVNU	Zoological Museum, Vietnam National University, Hanoi (47)
ZRC	Zoological Reference Collection, Department of Zoology, National University of Singapore (6)
ZSBS	Zoologisches Sammlung des Bayerischen Staates, Munich (1)
ZSI	Zoological Survey of India, National Zoological Collection, Calcutta (25)
—	Private collections (9)

Geographic Distribution and Current Population Estimates

Macaca mulatta inhabits parts of 11 countries in southern and southeastern Asia (Figs. 1, 2, 21), from ca. 15°N (in India, Thailand, Laos, and Vietnam) to ca. 36°N (in Afghanistan, Pakistan, India,

TABLE 1. Estimated population of *Macaca mulatta* in five countries for which data are available.[1]

Country	Population estimate (× 1,000)	References
Afghanistan	>4	Puget, 1971, p. 199
Bangladesh	190–276	Gittins & Akonda, 1982, p. 277; Feeroz et al., 1995, p. 75
China	205–218	Wang & Jiang, 1995, p. 9
India	>500	Southwick & Siddiqi, 1995, p. 19
Vietnam	20	Dang, 1983, p. 1284
Total	>919	

[1] Cf. MacKinnon & MacKinnon, 1987, p. 189.

and China) and from ca. 70°E (in Afghanistan and India) to ca. 120°E (in China). An isolated population that formerly occurred at 40°24′N in northeastern China apparently was extirpated in 1987 (Zhang et al., 1989, p. 380). The natural range of *M. mulatta* is known to include 12 shallow-water islands—one off the coast of southeastern Bangladesh (Maishkhal), four off the coast of northeastern Vietnam (Cat Ba, Quan Lan, Van Canh, and Van Hai), and seven off the coast of southeastern China (Hainan, Dahao, Dangan, Erzhou, Xianggang [= Hong Kong], Neilingding, and Shangchuan; the last six of these islands are near the mouth of the Zhujiang [= Pearl River]). Archaeological evidence suggests that ca. 4000 B.P. the range of *M. mulatta* may have extended as far west as Moenjo Daro, Pakistan (27°19′N, 68°07′E) (Mackay, 1931, p. 349; Iyer, 1977, p. 15).

Although the northern limit of natural distribution of *M. mulatta* apparently is determined primarily by physiographic or climatological factors, the southern limit apparently is determined primarily by interspecific competition. The northwestern limit of distribution is defined by the Great Indian Desert, the north-central limit by the Himalayas and Xizang-Qinghai (Tibetan) Plateau, and the northeastern limit in China by the transition from mesothermal to microthermal climate (Trewartha, 1978, p. 9). Contrastingly, the southwestern limit probably is related to competition with neighboring *M. radiata* (Fooden et al., 1981, p. 464), and the southeastern limit probably is related to competition with neighboring *M. fascicularis* (Fooden, 1997, p. 226). The actual distribution of *M. mulatta* is of course much more restricted than indicated above, primarily as a result of human activity (cf. McNeely, 1992, p. 374).

Two rejected locality records—one in Rajasthan, India, and the other in Xizang (= Tibet), China—are outside the limits of distribution of *M. mulatta*, indicated in Figures 1 and 21. In western Rajasthan, Bhargava (1982, p. 7) cited a postal survey report of *M. mulatta* at Babuwali, Jasalmer District (26°47′N, 69°44′E); subsequently this report was found to be spurious (Bhargava, 1984, p. 43).

In north-central Xizang, south of a pass through the "Dupleix" mountain chain (ca. 33°38′N, 89°43′E), Bonvalot (1891, vol. 1, p. 210; cf. 1892, p. 218) reported a sighting of "monkeys" with external characters suggestive of *M. mulatta*:

> Today [18 January 1890] we have seen monkeys crossing the frozen river and playing on the rocks which form its banks. But we cannot kill one of these animals, which are very short with red hair, small head, and an almost imperceptible tail.

According to Professor Feng Zuojian, IZCAS (pers. comm., 27 September 1985), who is an authority on Tibetan mammals, the occurrence of monkeys in this part of the Tibetan Plateau is highly improbable. Professor Feng suspects that Bonvalot actually observed a small group of marmots, presumably *Marmota himalayana* (Zhang et al., 1997, p. 170), which he misidentified as monkeys.

Although populations of *M. mulatta* now inhabit the Mumbai (= Bombay) region of India, this region is outside the natural range of the species; the existing populations in this region (Raj Bhavan compound, ca. 18°56′N, 72°55′E; Borivli National Park, ca. 19°10′N, 72°55′E) are the result of artificial introductions that occurred during World War II (Serrao & Amladi, 1979, p. 30). The populations that now inhabit the vicinity of Kowloon, China (ca. 22°20′N, 114°10′E), probably are the result of an artificial introduction that occurred during World War I (Herklots, 1951, p. 83); how-

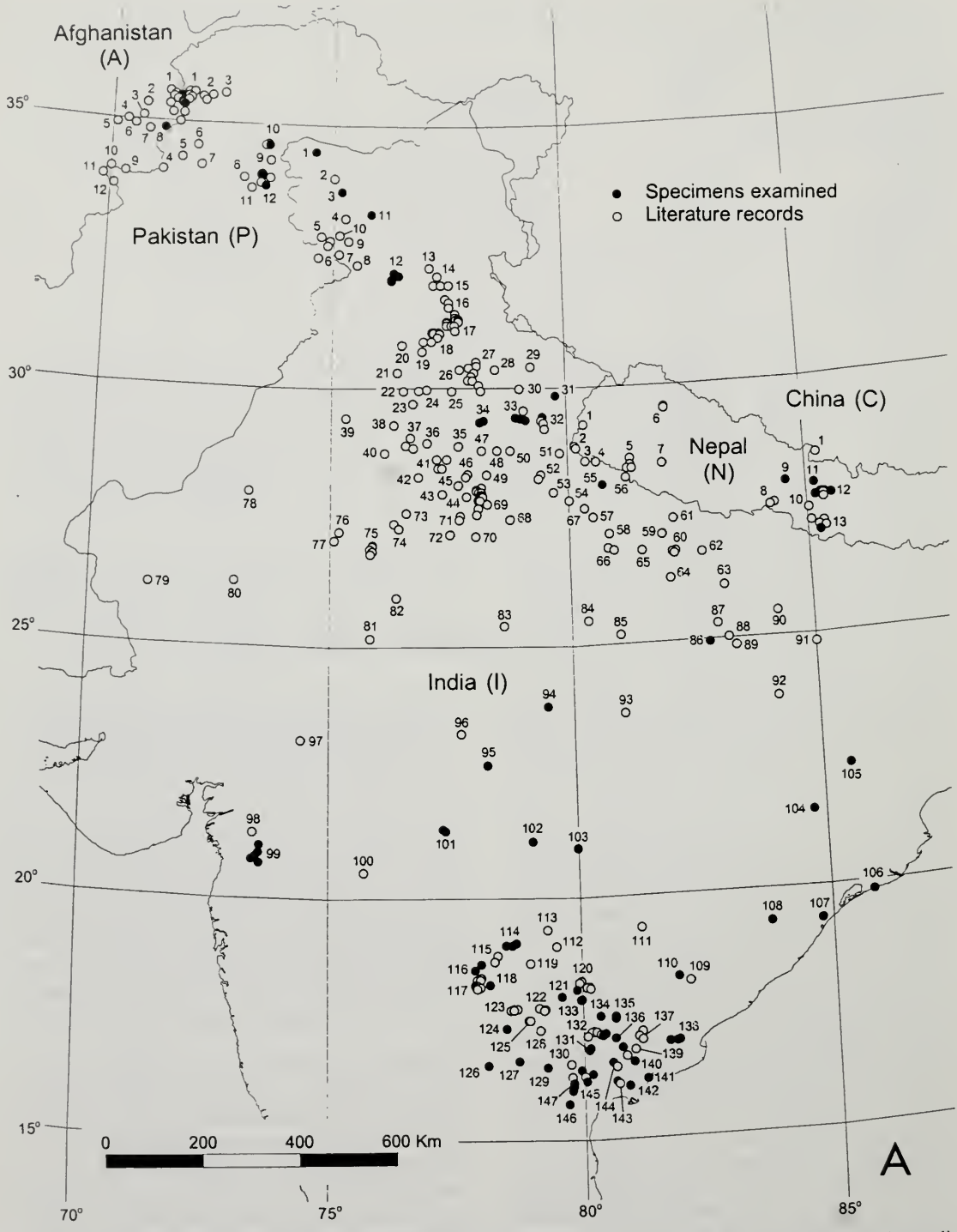

FIG. 2A. Detail map of *Macaca mulatta* localities, western section; for documentation, see Gazetteer, Appendix 2. Abbreviations in parentheses are those used in gazetteer locality codes; specimens examined include living monkeys personally observed in the field.

←

Afghanistan (A)

1. Asmar, east of; Asmar, northwest of; Barikowt, southeast of; Kamu Valley; Kouchlaus, south of; Landay Sind, left bank, near confluence with Kunar R.; Landay Sind, left bank, near Pule Saret; Landay Sind, near Chascoup; Landay Sind, near Merdech; Landay Sind, right bank, between Mandagal and Ormul; Landay Sind, right bank, near Sang e Safed; Landay Sind Valley, near Kamu Valley; Landay Sind Valley, southern slope; Mandagal, northwest of; Nurestan, eastern.
2. Wama, north of.
3. Gusalek, north of.
4. Nurestan vicinity.
5. Alicheng River, east of.
6. Alingar, east of.
7. Outapour, south of.
8. Chigha Sarai, north of.
9. Kotgay (= Cotgai), northeast of.
10. Kotgay (= Cotgai), east of.
11. Chamkani, northeast of.
12. Chamkani, southeast of.

China (C)

1. Gyirong Subcounty.

India (I)

1. Lolab; Lolab Valley.
2. Ovra Sanctuary, proposed.
3. Kotihar India.
4. Ramban Township vicinity.
5. Akhnoor; Chowkichora; Jammu; Nandini Wildlife Sanctuary; Narota-Bun, highway between.
6. Jammu & Kashmir, southern border with Pakistan.
7. Surinsar.
8. Kathua vicinity.
9. Ramnagar.
10. Dumel; Jhajjarkotli; Udhampur.
11. Dunwein.
12. Dharmsala; Kangra; Kangra Fort; Samayala.
13. Manali.
14. Jagatsukh.
15. Kasol; Kulu District; Kulu valley; Pulga.
16. Sainj; Sarahan; Tirthan.
17. Narkanda, ca. 1 km north of; Narkanda, ca. 4 km south of; Narkanda, ca. 5 km north of; Rampur, northwest of; Sungri, ca. 2 km south of; Sungri, ca. 4 km north of; Sungri, ca. 6 km northwest of; Sungri, ca. 10 km northwest of; Sungri, ca. 10 km southwest of; Sungri, ca. 15 km southwest of; Sungri, ca. 20 km south-southwest of; Sungri, north of.
18. Boileauganj; Cecil; Chail Sanctuary; Jakko Hill; Kasauli; Kufri, ca. 0.5 km southeast of; Kufri, ca. 1.5 km southeast of; Kufri, ca. 3 km southeast of; Nhera/Tara Devi; Simla, western suburb; Simla vicinity; Simla Water Catchment Reserve; Solon District; View, Simla vicinity.
19. Chandigarh, outskirts of.
20. Ambala District.
21. Patiala District.
22. Saraswati Forests.
23. Karnal District.
24. Kurukshetra District; Veer Sontri forests.
25. Saharanpur vicinity.
26. West Timli.
27. Aglar River; Asarori Forest; Dehra Dun; Dehra Dun vicinity; Dehra Dun vicinity, 600 m; Dhaulkot Forest; Hardwar; Kansrao; Mohan; Mussoorie vicinity; Rajaji Wildlife Sanctuary.
28. Tehri-Garhwal District.
29. Kedarnath Sanctuary.
30. Molta.
31. Bageshwar.
32. Haldwani; Hanumangarhi Hill; Kumaun Hills; Naini Tal; Ratighat
33. Dela; Jhirna; Ramganga River; Ramnagar.
34. Bijnor; Sita Bani.
35. Meerut District.
36. Sonepat District.
37. Kheri Sahd; Panipat-Rhotak, highway between; Rhohtak District.
38. Jind District.
39. Hissar District.
40. Bhiwani District.
41. Delhi; Delhi vicinity; Delhi-Mathura Road; Ghaziabad District; Lal Kuan; Meetha Pur; Tughlaqabad.
42. Rewari-Patudi-Gurgaon, highway between.
43. Delhi-Agra.
44. Khair.
45. Delhi-Hathras.
46. Bulandshahr District; Delhi-Aligarh.
47. Rampur-Ghaziabad.
48. Bareilly-Agra, highway between.
49. Makhena.
50. Moradabad vicinity.
51. Pilibhit-Tanakpur.
52. Bareilly; Kareilly, west of; Karghena, west of; Ramganga South Station.
53. Shahjahanpur-Bareilly, highway between.
54. Sitapur-Bareilly.
55. Haripur.
56. Nishangara; Nishangara vicinity.
57. Shahjahanpur-Lucknow.
58. Lucknow-Sitapur.
59. Gonda vicinity.
60. Ayodhya; Faizabad-Ajodhya; Faizabad vicinity.
61. Balrampur forest.
62. Ayodhya-Gorakpur.
63. Azamgarh vicinity.
64. Sultanpur vicinity.
65. Lucknow-Faizabad.
66. Halwapura; Kakori; Lucknow vicinity.
67. Sitapur-Shahjahanpur, highway between.
68. Delhi-Kanpur, highway between.
69. Achal Tank; Aligarh; Aligarh vicinity; Baj Garhi Bridge; Barauli Bridge; Barotha; Chaunpur; Chhatari-do-Raha; Harduaganj; Hathras; Jawan; Nanau; Qasimpur Canal; Sasni; Satha; Sindholi; Sumera; Sumera Fall Jungle.
70. Agra.
71. Mathura; Vrindavan.
72. Bharatpur.
73. Alwar District
74. Bandipul; Sariska Tiger Reserve.
75. Ambagarh Reserve Forest; Amer; Barri Chopal; Galta; Jaipur.
76. Umri Devi.

(*continued on following page*)

←

77. Marot.
78. Bikaner.
79. Sheo.
80. Jodhpur.
81. Kota.
82. Sawai Madhopur.
83. Jhansi.
84. Banda vicinity.
85. Chitrakut, Jagvedi and Bara Math Temples.
86. Saktesgarh.
87. Varanasi.
88. Chakia Forest Range.
89. Karkatgarh.
90. Shahabad District.
91. Sahebgunj.
92. Palamau.
93. Bandhavgarh National Park.
94. Kakara.
95. Sohagpur.
96. Bhopal, east of.
97. Tal Vraksh.
98. Kherwada Forest.
99. Ghori Hill; Hadya; Mahal, 2–5 km northwest of; Sadard Devi, 1 km west of; Vasunia, 3 km west of.
100. Ajanta Caves.
101. Bhim Kund Point; Punch Bol.
102. Nagpur.
103. Malua.
104. Deogarh.
105. Luia.
106. Harchandi Sahai; Puri.
107. Berhampur.
108. Gudari.
109. Balimila vicinity.
110. Malkangiri.
111. Orcha, ca. 1 km northwest of.
112. Gurjal.
113. Gundi.
114. Kausa Gutta; Khanapur, 3–5 km west of; Nirmal, 16 km east of.
115. Ankapur; Balkonda.
116. Ali Sagar; Rudrur Agricultural Station.
117. Hanmajipet; Ibrahimpet; Komlancha; Konapur; Magi; Mallur; Narva; Waddepalle.
118. Mustapur, 0.5 km east of.
119. Kondegattu temple.
120. Bussapuram; Dumpallagudem; Govindaraopeta; Jakaram, 4 km southwest of; Laxmidevipeta; Palampeta.
121. Warangal.
122. Gangupahad; Narayanapur; Raghunathapalle.
123. Mulug; Pamulaparthi; Tunki; Wargel.
124. Hyderabad.
125. Raigir; Yadagiri Gutta.
126. Velkicharla.
127. Charkonda.
128. Munipamula.
129. Siddeldar Hill.
130. Dachepalle.
131. Jaggayyapet; Jaggayyapet, 4 km north of.
132. Ballapet; Khammam; Mudigonda, Pallepadu; Tallada; Tanikella; Wira, 1 km south of.
133. Ashoknagar; Pakhal Lake, west side.
134. Yellandu.
135. Kothagudem; Kothagudem, 4 km north of.
136. Muttagudem.
137. Makkimarigudem; Tirumaladevipeta; Venketeswara Swami Temple.
138. Dommeru; Rajahmundry, 3 km northeast of; Rajahmundry, 13 km northeast of.
139. Dharmajigudem.
140. Hanuman Junction; Mudhalaparava; Yeppuru.
141. Gokavaram.
142. Velatur.
143. Kuchipudi; Tenali, 5.5 km west of.
144. Kondapalle; Vijayawada.
145. Anapalam; Kotanemalipuri; Narasaraopet, 2 km northwest of; Sattenapalle.
146. Darsi.
147. Angaluru; Kondra Mutla; Mellavagu; Vinukonda.

Supplementary Indian localities (received too late for inclusion in map; listed in Gazetteer): Dudhwa National Park; Kanha National Park.

Nepal (N)

1. Chaur.
2. Barmdeo Mandi; Sukla Phanta.
3. Bilauri.
4. Dhangarhi.
5. Aurn River, ca. 20 km above mouth; Babai River vicinity; Karnali River, ca. 30 km above mouth; Karnali River/Aurn River, ca. 10 km above confluence.
6. Hutu Forest; Pina, forests above.
7. Bheri River.
8. Dudurhani; Simri, Narayani River.
9. Chengli.
10. Hitaura.
11. Trisuli Bazar, 4 mi (= 6.5 km) southeast of.
12. Bouzini; Gaushalla; Gokarna; Katmandu; Nagarkot; Pashupati; Swayambhunath.
13. Chandikhola; Hazaria Patherghatta; Russian Camp; Simri, Birganj Forest District; Singaul.

Supplementary Nepalese localities (received too late for inclusion in map; listed in Gazetteer): Balthali, Kavre; GhodaGhodi Tal; Pokhara; Ramnagar; Sankhu-Bajrajogini; Tripureswor, Thapathali.

Pakistan (P)

1. Kanti vicinity; Kaotai; Kunar River; Mirkhani; Shishi Koh vicinity; Utzun vicinity.
2. Dokdusra; Gwaldri Valley; Landrai Valley.
3. Swat Kohistan region.
4. Khyber Pass vicinity.
5. Swat River.
6. Bar Chanrai Hill.
7. Pajja Hill.
8. Hazara District, southern.
9. Neelum Valley.
10. Paia; Paras vicinity; Shogran vicinity.
11. Margalla Hills.
12. Dunga Gali vicinity; Ghora Dhaka, 1 mi (= 1.6 km) east of; Kazinag; Machayara Game Reserve; Murree, outskirts; Nathia Gali; Patriata; Phala/Kutbor Game Reserve.

ever, this area probably had previously been inhabited by a natural population of *M. mulatta*.

Population estimates are available for *M. mulatta* in Afghanistan, Bangladesh, China, India, and Vietnam—five of the 11 countries inhabited by this species (Table 1). In these countries, the total estimated population is >919,000. Although comparable estimates are not available for Bhutan, Laos, Myanmar, Nepal, Pakistan, and Thailand, the combined area of *M. mulatta* habitat in these six countries is less than in the preceding five (Fig. 1), which probably indicates that the total living population of *M. mulatta* is less than two million. According to reports published in 1995, the population of *M. mulatta* recently has been increasing in India (Southwick & M. F. Siddiqi, 1995, p. 18) and has been decreasing in China (Jiang Haisheng et al., 1995, p. 178).

Pelage

General Characterization

Dorsal pelage coloration is a key character for species identification of *M. mulatta*. In *M. mulatta*, the fur of the lower back is conspicuously more erythristic than that of the upper back (Fig. 3). In specimens in prime pelage (see "Seasonal Variation," below), the color of the upper back varies from yellowish gray to golden brown to burnt orange, and the color of the lower back varies correspondingly from golden brown to burnt orange to intense burnt orange ("almost fiery red"; Pocock, 1932, p. 531; cf. Sikorska-Piwowska, 1959, p. 272). On the upper back, the proximal two-thirds of individual dorsal hairs is gray, and the distal one-third is annulated with alternating pale and dark bands, yellowish to golden and blackish (cf. Koppikar & Sabnis, 1976, p. 7); on the lower back, the grayish color of the proximal two-thirds of individual hairs is paler, the pale distal annulations are more erythristic, and the dark distal annulations are more dilute. The crown, nape, and sides of the head are approximately the same color as the adjacent upper back; the anterior edge of the crown is marked by a blackish superciliary streak, and the cheeks often are also fringed with blackish hairs. Crown hairs usually are smoothly directed posteriorly. Hairs on the side of the head usually form a small crest or whorl near the angle of the jaw (infrazygomatic crest; Fooden, 1995, p. 19); occasionally, this crest is elongated and extends upward between the eye and the ear as far as the side of the crown (transzygomatic crest; 44 of 240 specimens examined). The thinly haired facial skin is buffy to reddish, except for the upper eyelids, which are whitish (unpigmented). On the proximal part of the limbs, dorsal pelage is similar in color to that on the adjacent trunk; more distally, the pelage color of the limbs becomes less erythristic and more dilute. The basal one-fourth of the tail is approximately the same color as the adjacent lower back; the distal three-fourths is bicolor, dark brown dorsally and buffy ventrally. The ventral surface of the trunk and limbs is thinly haired, pale buffy to whitish. Broadly distributed areas of sexual skin undergo cyclical changes in color and swelling (see "Reproduction," below); in adult males, the glans is blue-black (Wilson & Vessey, 1968, p. 5).

The pelage in *M. mulatta* populations at upper elevations (ca. 2400 m) in India apparently is longer and sleeker than in nearby populations at lower elevations (Dodsworth, 1914, p. 730). In captivity, the pelage of dominant individuals, particularly high-ranking males, reportedly is sleeker than that of subordinate individuals (Chance, 1956, p. 5; Waterhouse & Waterhouse, 1971, p. 19). The large amount of grooming received by dominant individuals may contribute to their sleekness.

Abnormally pale "golden" *M. mulatta* individuals reportedly occur in various parts of India and Pakistan at an estimated frequency of 1/10,000 (Pickering & van Wagenen, 1969, p. 161; cf. Anonymous, 1978, p. 12; Kessler et al., 1986, p. 264). Dorsal pelage color in these aberrant individuals is pale yellowish anteriorly and pale reddish-golden posteriorly; the skin is virtually unpigmented, and retinal pigmentation also is reduced. Experimental breeding indicates that the "golden" condition probably is inherited as an autosomal recessive trait. Among specimens examined, a fluid-preserved late fetus or neonate with umbilical cord still attached (BM(NH) 1972.836), collected at Pyaunggaung, Myanmar, 14 May 1915, appears to be of the "golden" phenotype.

Early Development

Pelage color in *M. mulatta* neonates is pale brown to dark brown, generally somewhat darker than in adults (Tinklepaugh & Hartman, 1932, p.

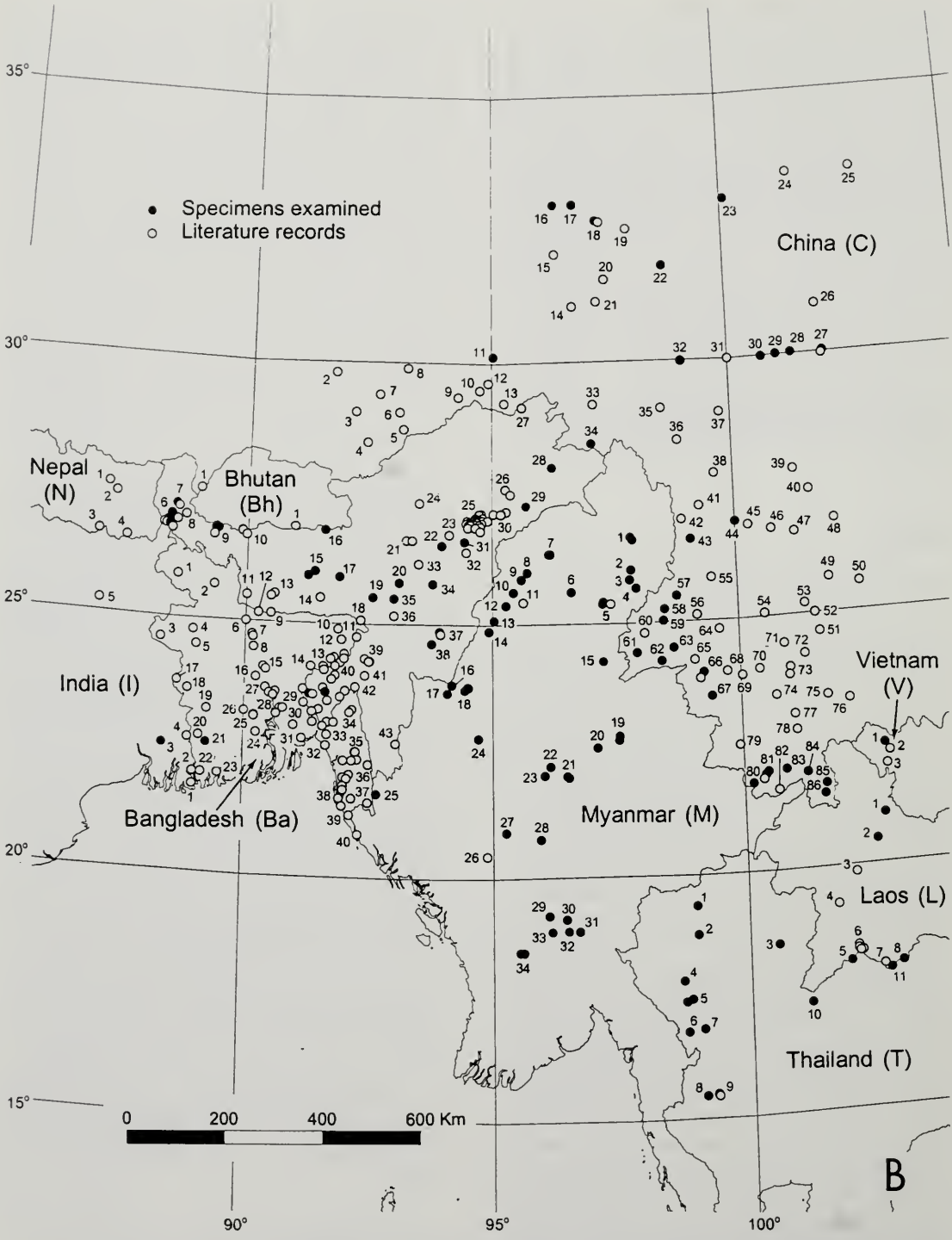

FIG. 2B. Detail map of *Macaca mulatta* localities, central section; for documentation, see Gazetteer, Appendix 2. Abbreviations in parentheses are those used in gazetteer locality codes; specimens examined include living monkeys personally observed in the field.

←

Bangladesh (Ba)

1. Dinajpur District.
2. Rangpur District.
3. Nawabganj vicinity.
4. Naogaon.
5. Madhupur, ca. 100 km west of.
6. Garo Hills, foot.
7. Madhupur National Park; Rasulpur vicinity.
8. Madhupur National Park, southern portion.
9. Mymensingh, northern.
10. Kalabokhani.
11. Patharia.
12. Fechugang.
13. Harargaj; Rajkandi; Rema-Kalenga; Srimangal Tea Estate; Srimangal vicinity; Sylhet Forest Division; Tarap; West Bhanugach.
14. Raghunandan.
15. Barmi; Borme.
16. Dhamrai.
17. Meherpur.
18. Chuadanga.
19. Jessore District.
20. Satkhira.
21. Sundarbans, ca. 50 mi (= 80 km) east of Calcutta.
22. Satkhira, southern.
23. Sundarbans.
24. Wazipur.
25. Char mugoria; Madaripur Township.
26. Faridpur District.
27. Bondor; Dhaka; Narayanganj; Sonargaon.
28. Matlab Bazar; Chandpur Bazar, Old; Puran Bazar.
29. Comilla District.
30. Matlab, southeast of.
31. Noakhali.
32. Sitakunda.
33. Chittagong, northern.
34. Chittagong Hill Tracts, northern; Pablakhali.
35. Chittagong, eastern; Hazarikhil; Kaptai; Kaptai Lake; Satghar; Sitapahar/Rampahar.
36. Chittagong Hill Tracts, eastern.
37. Cox's Bazar, northern; Sangu/Matamuhari.
38. Chittagong, southern; Chokoria Sunderbans; Chunati Wildlife Sanctuary; Cox's Bazar; Himchari; Kaptai, south of; Maiskhal Island; Padua.
39. Ukhia.
40. Teknaf Peninsula.

Bhutan (Bh)

1. Royal Manas National Park.

China (C)

1. Yadong Xian.
2. Maizhokunggar Xian.
3. Qusum Xian.
4. Lhünze Xian.
5. Tsari Chu.
6. Nang Xian.
7. Gyaca Xian.
8. Gongbo'gyamda Xian.
9. Dowoka.
10. Kongbo.
11. Yigong; Yigong Forest Reserve.
12. Gyala, above.
13. Mêdog Xian.
14. Ngamda.
15. Baizha Plantation.
16. Makehe Plantation.
17. Yushu Xian.
18. Jegu Xiang; Maluling.
19. Dainkog.
20. Routoumdo.
21. Qamdo.
22. Dêgê vicinity.
23. Baima.
24. Jigzhi.
25. Zoigê Xian.
26. Danba.
27. Kangding; Moshemien.
28. Olongche.
29. Yajiang.
30. Xi Golog.
31. Litang-Batang.
32. Batang vicinity; Kiang-ka.
33. Dzo La, southeast of.
34. Zayü Xian.
35. Yanjing vicinity.
36. Dêqên.
37. Xiangcheng.
38. Zhongdian.
39. Muli.
40. Yanyuan.
41. Weixi.
42. Fugong.
43. Biloxue Shan.
44. Ashi.
45. Lijiang.
46. Yongsheng [Xian].
47. Huaping [Xian].
48. Miyi.
49. Yuanmou.
50. Luquan.
51. Shuangbai.
52. Chuxiong.
53. Nanhua.
54. Nanjian.
55. Yunlong [Xian].
56. Baoshan.
57. Datang.
58. Hui-yao.
59. Tengchong (= Momien); Tengchong Xian.
60. Yingjiang.
61. Hotha Valley.
62. Santaishan.
63. Cala Shan.
64. Changning [Xian].
65. Nu Jiang, above Changlung.
66. Minglang; Yongde vicinity.
67. Gengma.
68. Nanding He.
69. Lincang Prefecture.
70. Lancang Jiang.
71. Jingdong Xian.
72. Ailao Shan (= Mountain) Reserve.
73. Wuliang Shan (= Mountain) Reserve; Zhenyuan Xian.
74. Jinggu Xian.
75. Mojiang Xian.
76. Lüchun.
77. Pu'er Xian.
78. Simao Xian.
79. Lancang Xian.
80. Meng-ban.

(*continued on following page*)

←

81. Menghai; Menghun; Shanman.
82. Menglong.
83. Mengyang.
84. Menglun.
85. Manpa.
86. Nonglin.

India (I)

1. Harinbhanga.
2. Jhilla.
3. Calcutta, Hastings Road; Calcutta, Indian Museum Compound; Calcutta, northern.
4. Basirhat Reserve Forest.
5. Bhagalpur District.
6. Mangpu; Narbong; Panighatta; Siliguri; Simulbari-Pankhabari; Sivok; Sivok, ca. 3 km east of; Sivok, ca. 5 km east of; Sivok, ca. 6 km east of; Sukna; Sukna-Kurseong.
7. Sikkim; Tarkhola.
8. Gorubathan forest.
9. Bharnabhari; Hasimara; Jaldapara Wildlife Sanctuary.
10. Jamduar vicinity; Maure, near; Raimona vicinity.
11. West Garo Hills District.
12. Balphakram region.
13. Garo Hills; Rongrenggiri vicinity.
14. United Khasi-Jaintia Hills.
15. Kulsi [River]; Rajapara.
16. Bogra Nadi.
17. Nongpoh.
18. Narpuh Reserved Forest.
19. Hot Springs.
20. Lamsakhang.
21. Baguri Block; Haldhibari Block.
22. Golaghat.
23. Neghereting.
24. Dafla Hills.
25. Adupuria; Akhoiphutia; Bahgara; Bezogaon; Cherekapar, near; Chetia; Dichialgaon; Dihajan habi; Hatighuli; Japisojia; Jayrapar; Jhanji; Judi-Jatakia; Kathpar; Khanamukh; Lunpuriagaon; Mesogarh; Meteka; Misajan; Moduri; Nanglamora; Nimaijan-Bahdhora; Rajmai tea garden, east of National Highway No. 37; Rajmai tea garden, west of National Highway No. 37; Sala Reserve Forest; Saraguri; Tipomia.
26. Dangori Nadi, near; Tinsukia District (Bherjan, Borajan, Podumoni R. F.).
27. Yongyap Chu.
28. Dening.
29. Margherita.
30. Dhuniopathar; Dillighat; Diroi (Rangoli) Reserve Forest; Sapekhati Reserve Forest.
31. Changchang Pani.
32. Chungtia.
33. Mikir Hills.
34. Samaguting.
35. Cachar District.
36. North Cachar Hills.
37. Imphal, ca. 4 mi (= 6.5 km) north of; Imphal, Mahabali temple.
38. Bishenpur.
39. Gharmur, ca. 1 km south of; Nagorhgena; North District, northeastern; Paach piror mukam.
40. Ampi Bazar, ca. 3 km southeast of resthouse; Charilam resthouse; Gumti Sanctuary; North District, north-central; North District, northwestern; North District, western; South District, north-central; South District, south-central; South District, southeastern; South District, southwestern; South District, west-central; West District, east-central; West District, south-central; West District, southern; West District, southwestern; West District, western.
41. North District, eastern.
42. North District, southeastern; North District, southwestern; South District, northeastern.
43. Phawngpui Wildlife Sanctuary.

Supplementary Indian locality (received too late for inclusion in map; listed in Gazetteer): Manas National Park.

Laos (L)

1. Ou, Nam, between Muang Khoua and Muang Ngoy.
2. Ou, Nam (= Nam hou).
3. Louangphrabang.
4. Xaignabouri.
5. Mekong River, 90 km above Viangchan.
6. Ban Kuai, several km south of; Ban Napo vicinity; Ban So vicinity; Ban Wangma vicinity.
7. Viangchan.
8. Ban Mak Nao.

Myanmar (M)

1. Bawmwang; Htingnan Triangle.
2. Hkandau.
3. N'Changyang.
4. Tanga-Shingaw, road between.
5. Karen Chaung; Myitkyina; Tang Hpre.
6. Nanyaseik.
7. Taga Hka; Taro.
8. Singkaling Hkamti, northern Chindwin River; Singkaling Hkamti, right (west) bank; Singkaling Hkamti, upper Chindwin River, east bank.
9. Heinsun.
10. Moklok.
11. Tamanthi Wildlife Sanctuary.
12. Hisweht.
13. Maungkan.
14. Homalin.
15. Bhamo.
16. Kindat, 20 mi (= 32 km) northwest of.
17. Ali Cha.
18. Kindat; Tatkon, near Kindat, east bank of Chindwin River; Tatkon, near Kindat, west bank of Chindwin River.
19. Mansam Falls; Se-eng.
20. Pyaunggaung.
21. Lethan Hka; Maymyo.
22. Madaya.
23. Mingun.
24. Kin; Yin, east bank of lower Chindwin River; Yin, lower Chindwin River.
25. Chittagong Hill Tracts.
26. Irrawaddy River, left bank, below Yenangyaung.
27. Popa Hill.
28. Kokkoaing.
29. Toungoo, 30 mi (= 48 km) northwest of.
30. Toungoo, 15 mi (= 24 km) north of.

259; Hill, 1974, p. 565; Roonwal & Mohnot, 1977, p. 147; Kessler et al., 1986, p. 264; Higley et al., 1987, p. 9); the crown hair of neonates is parted by a midline bare area. At birth, the bare skin of the face, hands, and feet is dull purple, but within about 5 minutes it gradually becomes pale pink (Rawlins, 1979, p. 432). Skin color changes from pinkish to buffy by age ca. 2 months, and the dark neonatal pelage is gradually replaced by paler pelage, similar in color to that in adults and without a coronal part, by age ca. 6 months (Hinde et al., 1964, p. 611; Roonwal & Mohnot, 1977, p. 147; Higley et al., 1987, p. 9). In two young infant specimens examined (FMNH 82806, 82807, Yin, Myanmar, 18 June 1915), with deciduous first incisors emerging (age <7 weeks; cf. Fig. 16), the dorsal pelage is relatively thin and fine-textured—brown on the crown, pale yellowish brown on the upper back, pale burnt orange on the lumbosacral region, and pale ochraceous on the tail and limbs; the face is nearly naked, and the underparts are thinly covered with short pale ochraceous hairs. In two older infants (AMNH 57108, Eastern Tombs, China, winter 1929; FMNH 99671, Huai Kwang Pah, Thailand, 29 March 1967), with deciduous second upper molars erupting (age ca. 5 months), the pelage is essentially similar in color and texture to that in adults. However, fine-textured pelage may be retained by some young juveniles, even after the permanent first molars have begun to erupt (USNM 20122, Lolab, India, 9 September 1891, age >1 year).

The reaction of captive adult females to 6-month-old infants with either naturally colored buffy faces or artificially colored pink faces (similar in color to the faces of neonates) has been investigated experimentally (Higley et al., 1987, p. 16). In this study, the adult females paid more attention to pink-faced (neonate-like) infants than to buffy-faced infants.

Seasonal Variation

Macaca mulatta undergoes seasonal molting, both in natural populations (Pocock, 1932, p. 531; Pearl et al., 1987, p. 38) and in captivity (Hartman, 1931, p. 141; Stewart, 1933, p. 30; Rowell, 1963, p. 195; Vessey & Morrison, 1970, p. 90; Morrison & Menzel, 1972, p. 63; MacArthur et al., 1978, p. 155; Wolfe, 1985, p. 243; O'Neill-Wagner, 1997, p. 138). In natural populations, most postinfantile specimens collected during the period September–February are in prime pelage (Fig. 4; cf. Pocock, 1932, p. 531; Pearl et al., 1987, p. 38). In this condition, the fur on the dorsal surface is richly colored, lustrous, long, soft, and smooth; the pale distal annulations on individual dorsal hairs are bright, crisp, and conspicuous (e.g., FMNH 35448, adult male, Mangpu, West Bengal, India, 5 December 1930). A slight fading of the pelage may become evident as early as October, but this early-stage fading is most commonly seen in March; compared with prime pelage, the dorsal fur is more grayish, less lustrous, and somewhat disheveled, and the contrast between the pale distal annulations and adjacent darker regions of individual hairs is reduced (FMNH 99668, adult female, Ban Mae Lamao, Thailand, 21 March 1967). In subsequent months fading continues, with the result that dorsal fur in most specimens collected from April through June is dull colored, weakly annulated, streaky, harsh textured, and scraggly (late-stage fading); at this

---

←

31. Toungoo, 13 mi (= 21 km) east of.
32. Toungoo, east side of Sittang River.
33. Toungoo, 20 mi (= 32 km) west of.
34. Pye (= Prome), 30 mi (= 50 km) southeast of; Pye (= Prome), 35 mi (= 55 km) southeast of.

Nepal (N)

1. Sankhuwa Khola.
2. Sabaya Khola.
3. Kosi River.
4. Morang region.

Supplementary Nepalese localities (received too late for inclusion in map; listed in Gazetteer): Heluwabeshi; Lakuwa; Sagarmatha (= Mount Everest) National Park; Siva (= Shiva).

Thailand (T)

1. Chiang Dao.
2. Chiang Mai, near.
3. Pang Nam Un.
4. Kaeng Mae Hat (rapids).
5. Huai Ap Nang; Huai Kwang Pah.
6. Ban Mae Lamao.
7. Tha Chang Tai.
8. Ban Umphang, 28 mi (= 45 km) southeast of.
9. Khao Nang Rum, western slope; Khao Nang Rum Research Station.
10. Dan Sai district.
11. Nong Khai.

Vietnam (V)

1. Muong Boum.
2. Muong Mo.
3. Muong Cha.

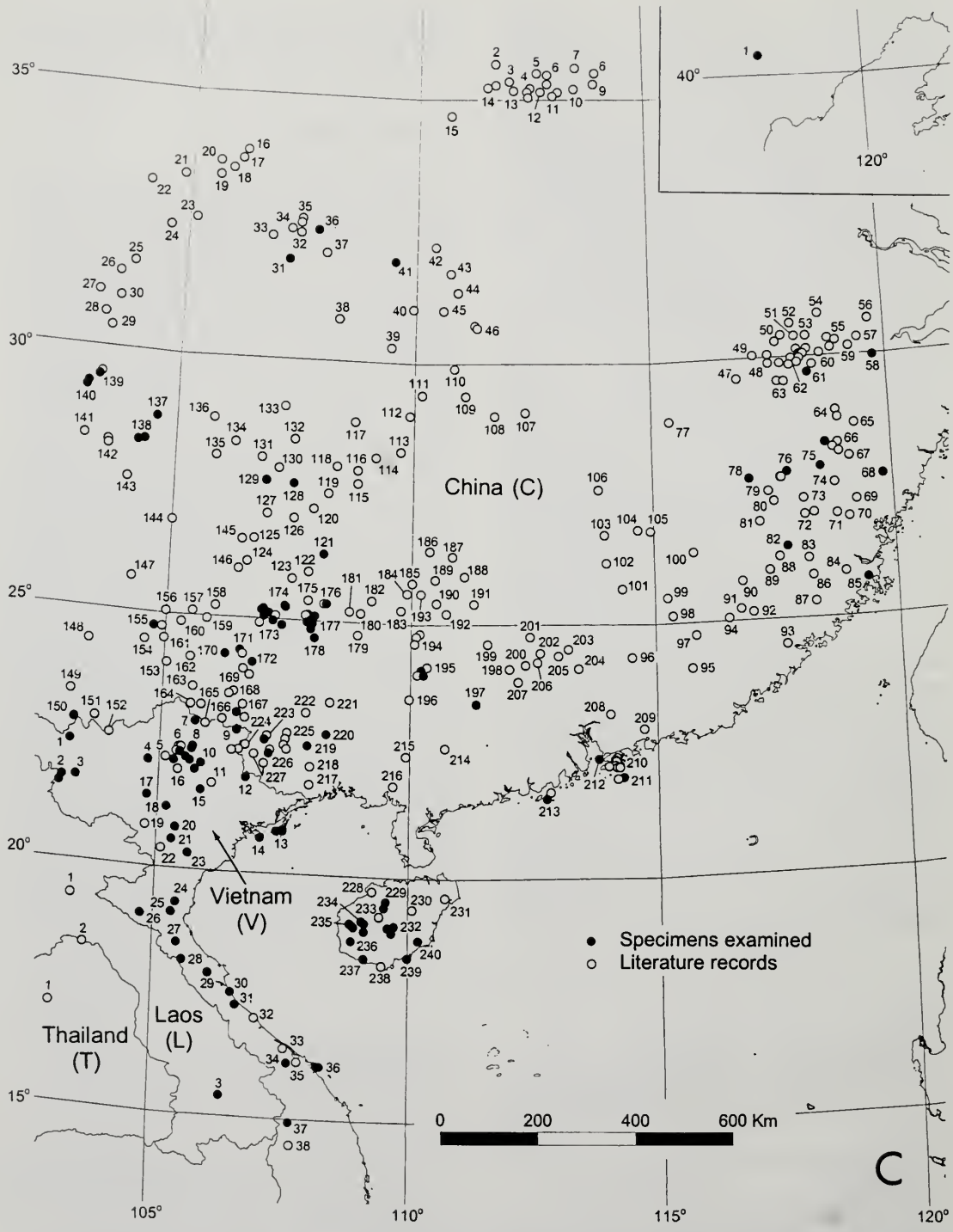

FIG. 2C. Detail map of *Macaca mulatta* localities, eastern section; for documentation, see Gazetteer, Appendix 2. Abbreviations in parentheses are those used in gazetteer locality codes; specimens examined include living monkeys personally observed in the field.

←

China (C)

1. Huashi, north of; Liulipenshan; Xianglong Xian, southern.
2. Yicheng.
3. Li Shan National Nature Reserve.
4. Jiyuan, ca. 30 km northwest of; Manghe Nature Reserve; Taihang Shan.
5. Yangcheng.
6. Jincheng; Shanxi, southeastern.
7. Lingchuan, southeast of.
8. Huixian.
9. Xinxiang Xian.
10. Xiuwu Xian.
11. Boai; Qinyang.
12. Jiyuan, ca. 20 km northeast of.
13. Jiyuan, ca. 80 km west-northwest of.
14. Yuanqu; Zhongtiao Shan.
15. Ruicheng.
16. Liangdang.
17. Huixan.
18. Baishuijiang Natural Reserve.
19. Kangxian.
20. Chengxian.
21. Wudu.
22. Nanping.
23. Qingchuan.
24. Pingwu.
25. Maowen.
26. Wenchuan.
27. Wassuland.
28. Wanglang Natural Reserve.
29. Qionglai.
30. Guanxian.
31. Tongjiang Xian.
32. Dashuping.
33. Nanjiang.
34. Chengjaba.
35. Dahe; Longchi.
36. Zhengba Xian.
37. Wanyuan.
38. Wanxian.
39. Enshi.
40. Wushan.
41. Zhenping.
42. Zhushan.
43. Shennongjia Forestry Region.
44. Huangliangping.
45. Zigui.
46. Yichang; Yichang (= Ichang), Chang Jiang (= Yangtze) gorges above.
47. Zhaotan.
48. Guniujiang; Liukou, Qimen Xian.
49. Gegong.
50. Jiuhua Shan; Tangxi.
51. Jiuhua Shan, ca. 30 km east of.
52. Jiuhua Shan, ca. 30 km northeast of.
53. Biyun, ca. 30 km north of.
54. Yangliupu.
55. Daoshiwu; Hule; Qingliangfeng.
56. Anji Xian.
57. Laodian.
58. Xindeng.
59. Changhua vicinity.
60. Jixi.
61. Shexian; Tunxi.
62. Biyun; Dalingxia; Fuxi; Huangshan; Jilian; Rucun; Shimen; Tong Kou; Yixian.
63. Liukou, Xiuning Xian; Qihong.
64. Huangtankou; Quxian.
65. Xinluwan.
66. Julongshan Nature Reserve; Zhidaikou; Zhoucun; Zhuxi.
67. Kucun.
68. Huangqiao.
69. Zhouning Xian.
70. Pingnan Xian.
71. Jiufeng Shan.
72. Fangdao Nature Reserve; Jian'ou Xian.
73. Jianyang Xian.
74. Songxi Xian.
75. Pucheng.
76. Chong'an Xian; Kuatun; Shangang Nature Reserve; Wuyi Shan Nature Reserve.
77. Fengxingshan.
78. Zixi Xian.
79. Guangze Xian.
80. Shaowu Xian.
81. Taining; Taining Xian.
82. Sha Xian.
83. Youxi.
84. Yongtai Xian.
85. Fuqing vicinity.
86. Daiyun Shan.
87. Yongchun.
88. Sanming Xian.
89. Yong'an.
90. Liancheng Xian.
91. Meihua Shan.
92. Longyan Xian.
93. Longxi.
94. Shanghang Xian.
95. Xingning.
96. Lianping.
97. Bachi.
98. Anyuan.
99. Shuanyuan.
100. Ningdu.
101. Chongyi.
102. Guidong.
103. Ninggang.
104. Luyuan.
105. Taihe.
106. Pinxiang vicinity.
107. Qiasui.
108. Changde.
109. Cili.
110. Suoxi Valley.
111. Sangzhi.
112. Yongshun.
113. Jishou.
114. Songtao.
115. Jiangkou.
116. Fanjingshan.
117. Youyang.
118. Yinjiang.
119. Shiqian.
120. Yuqing.
121. Getou.

←

122. Sandu.
123. Dushan.
124. Huishui.
125. Guiyang.
126. Weng'an.
127. Kaiyang.
128. Meitan, near.
129. Zunyi.
130. Suiyang.
131. Gulin.
132. Zheng'an.
133. Nanchuan.
134. Xishui.
135. Tongzi.
136. Hejiang.
137. Yibin.
138. Tseo-Jia-Geo; Yunnan border; Yunnan border, south of Yibin.
139. Emei Shan; Leshan (= Kia-ting), mountains 30 mi southwest of; Shihshahshu Temple.
140. Gin Keo Ho, cliff above; Wa Shan.
141. Meigu.
142. Leibo; Yongshan.
143. Yiliang.
144. Shuicheng Xian vicinity.
145. Qingzhen.
146. Changshun.
147. Fuyuan.
148. Mile.
149. Gejiu.
150. Jinping.
151. Pingbian.
152. Hekou.
153. Guangnan.
154. Maojie Bird Reserve.
155. Fameng; Jinzhong Shan Bird Reserve.
156. Xingyi.
157. Anlong.
158. Wangmo.
159. Ceheng.
160. Dahongbao Nature Reserve.
161. Huagong Water Regulation Forest Reserve.
162. Nazuo Water Regulation Forest Reserve.
163. Funing.
164. Defu Water Regulation Forest Reserve; Longhua Water Regulation Forest Reserve.
165. Nongxin Water Regulation Forest Reserve.
166. Dizhou Water Regulation Forest Reserve.
167. Ditin; Gulong Shan Water Regulation Forest Reserve; Motianling.
168. Dawanglin Water Regulation Forest Reserve; Huanglian Shan Water Regulation Forest Reserve.
169. Baidonghe Water Regulation Forest Reserve; Chengbihe Water Regulation Forest Reserve.
170. Batu.
171. Cenwanglao Shan Nature Reserve; Yuhun.
172. Gao Lo Shan.
173. Bamo village, near; Buliuhe Water Regulation Forest Reserve; Chuan Dong; Chuandonghe Water Regulation Forest Reserve; Guangli, 50 m above; Hongshui He, between Tian'e and Hai Zhou; Hongshui He, left bank, 9 km and 10 km below Heke; Hongshui He, right bank, 500 m below Heke; Koditan; Sanpihu Water Regulation Forest Reserve; Tian'e.
174. Liuzhai vicinity; Lungli vicinity.
175. Libo.
176. Xunle vicinity; Xunle Water Regulation Forest Reserve.
177. Dongmen; Dongshan; Jenli, 2–3 km north of; Mulun Nature Reserve; Pochuan, 6–7 km west of; Xianan; Xianan-Mulun.
178. Cioupu Shan; Hechi Prefecture; Jinchengjiang.
179. Luocheng.
180. Sijian Shan Water Regulation Forest Reserve.
181. Jiuwanshan Water Regulation Forest Reserve.
182. Yuanbao Shan Nature Reserve.
183. Shoucheng (= Shocheng) Water Regulation Forest Reserve.
184. Huaping Nature Reserve.
185. Longsheng.
186. Chengbu.
187. Xinning Xian, Southern.
188. Quanzhou.
189. Mao'er Shan Nature Reserve.
190. Yindian Shan Water Regulation Forest Reserve.
191. Qianjiandong Water Regulation Forest Reserve.
192. Haiyang Shan Water Regulation Forest Reserve.
193. Qingshi Tan Water Regulation Forest Reserve.
194. Jiaqiaolin Water Regulation Forest Reserve; Lagou Bird Reserve; Xilin Shan Water Regulation Forest Reserve.
195. Dayao Shan Nature Reserve; Laoshan; Piangzu; Puquan Road Maintenance Station.
196. Daping Shan Nature Reserve.
197. Wuzhou; Xi Jiang.
198. Nan Ling.
199. Gupo Shan Water Regulation Forest Reserve.
200. Wangjuanshan.
201. Lianzhou.
202. Yangshan.
203. Shanmoji.
204. Yingde.
205. Boluo.
206. Qigong.
207. Huaiji.
208. Luofu Shan.
209. Huidong.
210. Dahao Dao; Eagle's Nest Trail; Kam Shan Entrance; Sam Shui Wan Valley; Shing Mun Country Park; Tai Po Kau Nature Reserve; Tai Tam Reservoir; [Victoria] Peak.
211. Dangan Dao; Erzhou Dao.
212. Neilingding Dao.
213. Beichuanshan; Miwan.
214. Tiantang Shan Water Regulation Forest Reserve.
215. Linwan Shan Water Regulation Forest Reserve.
216. Guixi.
217. Shiwan Dashan Water Regulation Forest Reserve.
218. Shangsi.
219. Bapon.
220. Nanning.
221. Daming Shan Nature Reserve.
222. Longjun (= Lingjun) Hsienmu Reserve.
223. Daxin Rare Animal Reserve; Zhongzhou.
224. Chunxiu Water Regulation Forest Reserve; Qinglong Shan Water Regulation Forest Reserve; Xialei Water Regulation Forest Reserve.

stage, the tips of individual hairs frequently are abraded (FMNH 99669, adult male, Huai Ap Nang, Thailand, 29 March 1967). From June to October, but most commonly in July and August—which is the peak of the rainy season in most parts of the range of *M. mulatta*—molting occurs, and the faded old fur is replaced by short bright new fur, first on the crown and tail, next on the arms and legs, and finally on the back and flanks (BM(NH) 1915.5.5.3, adult male, Homalin, Myanmar, 14 July 1914). Although the process of fading, molting, and hair replacement is gradual, and the assignment of marginal specimens to particular stages in the process is therefore somewhat arbitrary, the general pattern is reasonably clear.

Captive populations in England and in Maryland and Florida, U.S.A., reportedly molt in the spring or summer (Hartman, 1931, p. 141; Rowell, 1963, p. 195; MacArthur et al., 1978, p. 155; Wolfe, 1985, p. 243; O'Neill-Wagner, 1997, p. 138); this is similar to the timing of molting in natural populations (Fig. 4). In individual members of a captive free-ranging population (n = 156–186), the duration of the molting stage varied from 4 weeks to 16 weeks and generally was longest in adult males (Vessey & Morrison, 1970, p. 90).

Pocock (1932, p. 532; 1939, p. 47) suggested that the molting season in *M. mulatta* may vary geographically, depending on local environmental conditions. This suggestion is supported by evidence from two free-ranging colonies studied by Vessey and Morrison (1970, p. 92) and evidence from one translocated free-ranging group studied by Morrison and Menzel (1972, p. 63). Vessey and Morrison found that the molting period in a colony at Cayo Santiago, Puerto Rico (January–May), is about 3 months earlier than in a colony at La Parguera, Puerto Rico (April–August). The La Parguera colony inhabits a pair of relatively dry islands ca. 160 km southwest of Cayo Santiago, which is relatively wet; the timing of molting in the La Parguera colony is fairly close to that in natural populations of *M. mulatta* (Fig. 4). The group studied by Morrison and Menzel was translocated in July 1966 from Cayo Santiago to Desecheo I., a relatively dry island ca. 60 km north-

---

←

225. Chongzuo Rare Animal Reserve; Fusui Rare Animal Reserve; Longhu Shan Nature Reserve; Xidaming Shan Water Regulation Forest Reserve.
226. Longan; Longrui (= Lingrui) Nature Reserve.
227. Longgang Nature Reserve; Ningming.
228. Danzhou.
229. Nada; Nanfeng (= Nam Fong) Shi.
230. Tunchang Xian.
231. Wenchang Xian.
232. Pisui; Wuzhi Shan; Zhayun.
233. Baisha.
234. Bawangling; Mihouling; Yiajia.
235. Changtian; Dongfang; Xi Shia.
236. Jianfengling.
237. Nychow (?= Yai-ch'eng) vicinity.
238. Sanya.
239. Nanwan; Nanwan Nature Reserve.
240. Xinlong.

Laos (L)

1. Xiangkhoang.
2. Muang Pakxan.
3. Muang Thateng.

Thailand (T)

1. Kumpawapi Park.

Vietnam (V)

1. Bac Tan Trai.
2. Muong Muon; Muong Pon.
3. Muong Moun.
4. Nam Ngap.
5. Cham Chu; Chiem Hoa.
6. Ban Bung vicinity; Ban Thi; Cho Don District; Gam, Song, left bank; Tat Ke vicinity; Thanh Tuong.
7. Ly Bon.
8. Ban Vay; Po Lu.
9. Trung Khanh District.
10. Bac Can; Linh Thong.
11. Dinh Ca.
12. Lang Son Province.
13. Quan Lan, Dao; Van Canh, Dao; Van Hai.
14. Ang Co; Cat Ba Dao.
15. Thai Nguyen.
16. Kien Thiet vicinity.
17. Thuong Bang La.
18. Thanh Son.
19. Tin Toc Forest.
20. Hoa Binh.
21. Phu Vach.
22. Hoi Xuan.
23. Cuc Phuong.
24. Nghia Dan.
25. Nghia Dung.
26. Ban Bu.
27. Huong Son (= Muong Son) District.
28. Trai Tru.
29. Ky Son.
30. Bo Trach District.
31. Xuan Ninh.
32. Vinh Linh region.
33. Hue.
34. Song-Ta-Voy.
35. Bach Ma National Park.
36. Son Tra, Mt.; Son Tra, Mt., 3.9 km west and 0.3 km south of.
37. Dak Sut.
38. Mom Ray (= Mon Ray) Nature Reserve.

west of La Parguera; after a transitional molting season in 1967, the onset of the molting season in the Desecheo group apparently shifted to May (1968–1971), close to the onset at La Parguera, instead of January, when the molting season begins at Cayo Santiago.

In natural populations, the peak of the molting season usually coincides with the end of the birth season, and most individuals are in prime pelage during the mating season (cf. Fig. 4, Table 22). A similar relationship between molting and birth seasons also prevails in the free-ranging Cayo Santiago and La Parguera populations (Vessey & Morrison, 1970, p. 92); in the Desecheo group, the molting peak apparently occurs after the birth season (Morrison & Menzel, 1972, p. 75). In the La Parguera colony, molting tended to occur earlier in mature males and mature nonpregnant females than in immatures and pregnant females, which usually molted after parturition (cf. O'Neill-Wagner, 1997, p. 138); this suggests that molting may be controlled, at least in part, by sex hormones (cf. Dietz et al., 1995, p. 282). Anomalously, one 4-year-old pregnant female in the La Parguera colony molted twice in the same year, once after the mating season and once after the birth season.

Other species of macaques in which seasonal molting has been reported are *M. fuscata*, *M. radiata*, *M. assamensis*, and *M. thibetana* (Pocock, 1931, p. 276; 1939, p. 52; Hill, 1974, p. 765; Fooden, 1981, p. 9; 1982a, p. 6; 1983, p. 8; Inagaki & Nigi, 1988, p. 82). Molting in *M. fuscata*, *M. radiata*, and *M. assamensis* apparently occurs in May or June, which probably is slightly earlier than usual in natural populations of *M. mulatta*. Molting in *M. thibetana* apparently occurs in late summer (ca. August), which is about the same as in natural populations of *M. mulatta*.

Geographic Variation

Pelage characters have served as the primary basis for recognition of subspecies in *M. mulatta*. For this reason, detailed analysis of geographic variation of these characters is required. As indicated by Pocock (1932, p. 533), the preferred standard of comparison for such an analysis would be the type specimen, which unfortunately has not been preserved. Lacking the type specimen, specimens collected at or near the type locality will be used as standards of comparison.

Nepalese Standards—The type locality of *M. mulatta*, originally given as "India," subsequently was restricted by Pocock (1932, p. 533) to "Nepal Tarai" (now spelled "Terai"), which is the narrow plain that extends along the southern border of Nepal (Karan, 1960, p. 1). One specimen from the Nepal Terai is now available; this topotype is BM(NH) 1922.5.16.2, an adult male in prime pelage, collected 17 February 1921 at Hazaria Patherghatta (ca. 27°00′N, 85°15′E), 180 m (Fig. 3A). Dorsal pelage in this specimen is bright golden brown anteriorly, becoming intensely burnt orange on the lumbosacral region (cf. Pocock, 1932, p. 534). Interscapular hair length (ISHL) is ca. 50 mm. The tail is not particularly bushy; midtail hair length (MTHL) is ca. 25 mm.

Two near topotypes, also in prime pelage, are available from higher elevations in Nepal—BM(NH) 1921.5.1.1, adult female, 15 October 1920, Nagarkot (ca. 85 km northeast of Hazaria Patherghatta), 2400 m, and BM(NH) 1931.1.11.11, late juvenile male, 7 December 1922, Chengli (ca. 130 km northwest of Hazaria Patherghatta), altitude unspecified. Dorsal pelage color in these two skins is slightly more erythristic than in the topotype. Hair length (female, ISHL = 40 mm, MTHL = 10 mm; male, ISHL = 60 mm, MTHL = 30 mm) is similar to that in the topotype.

Ten additional Nepalese specimens examined are less useful for pelage comparisons. These are BM(NH) 1921.5.1.2, infant female; FMNH 104164, young juvenile male (M1, I1), early-stage faded pelage; BM(NH) 1931.1.11.10, juvenile female collected in June, beginning to molt; four badly deteriorated skins collected before 1846 (BM(NH) 1845.1.8.222–1845.1.8.224, 1972.1015); and three juveniles preserved in fluid (FMNH 135427–135429).

Survey of Sample Areas—In subsequent paragraphs, postinfantile *M. mulatta* specimens collected in 30 sample areas within the specific range (Fig. 5) are compared with the three Nepalese skins that are in prime pelage (BM(NH) 1921.5.1.1, 1922.5.16.2, 1931.1.11.11). Museum catalog numbers are indicated where the number of specimens in a cited sample subset is less than five.

1. India: northern Uttar Pradesh, ca. 600 km west-northwest of Hazaria Patherghatta; 12 skins, seven localities. Eleven specimens, collected October–March, are in prime pelage, and one (BM(NH) 1931.1.11.3), collected in January, is early-stage faded. In seven of the specimens in prime pelage, collected October–March, dorsal pelage color is essentially similar to that in the three Nepalese standards; in the remaining four (BM(NH)

FIG. 3. Dorsal pelage color in *Macaca mulatta*. **A.** Topotype—BM(NH) 1922.5.16.2, adult male, collected 17 Feb. 1921 at Hazaria Patherghatta, 600 ft (= 180 m), Nepal. **B.** Contrasting pelage color in two adult males collected 4 days apart at Rajapara, 600 ft (= 180 m), Assam, India—BM(NH) 1931.1.11.7, 21 Nov. 1920 (left), and BM(NH) 1921.7.9.3, 25 Nov. 1920 (right). Scale bar = 15 cm.

1914.7.10.3–5; BNHS 5108), collected October–January, the color is distinctly less erythristic—pale yellowish brown anteriorly becoming washed with burnt orange on the lumbosacral region. Bright and dull specimens have been collected in the same month at each of two localities (Bageshwar and Ratighat). ISHL is 51.4 ± 2.9 mm (mean ± SD) in three adult females and 61.0 ± 6.5 mm in five adult males. MTHL is 20 mm and 30 mm in two adult females and 27.5 ± 5.0 mm in four adult males; in two of these males (BM(NH) 1914.7.10.1 and 1914.7.10.2, both collected at Bageshwar), the tail is somewhat bushy.

2. India: northwestern Himachal Pradesh, ca. 1,000 km northwest of Hazaria Patherghatta; six skins, three localities. Of three specimens in prime pelage, two (BM(NH) 1933.12.1.2: BNHS 5112), collected in February and March, are brightly colored—similar to the Nepalese standards, and one (BNHS 5114), collected in March, is slightly less erythristic. Three specimens (BM(NH) 1923.9.1.118, 1931.1.11.34–35), collected in March and May, are late-stage faded—pale yellowish gray anteriorly, faintly washed with burnt orange posteriorly. ISHL is 65 mm in one adult female and 60 and 80 mm in two adult males; MTHL is 20 and 35 mm in two adult males.

3. India: southwestern Jammu and Kashmir, ca. 1,300 km northwest of Hazaria Patherghatta; 11 skins, four localities (including type locality of *Macacus rhesus villosus* True, 1894). Ten specimens are in prime pelage, and one (USNM 173814), collected in February, is early-stage faded. Five of the specimens in prime pelage, collected in September and month unspecified (one specimen), are brightly colored—similar to the Nepalese

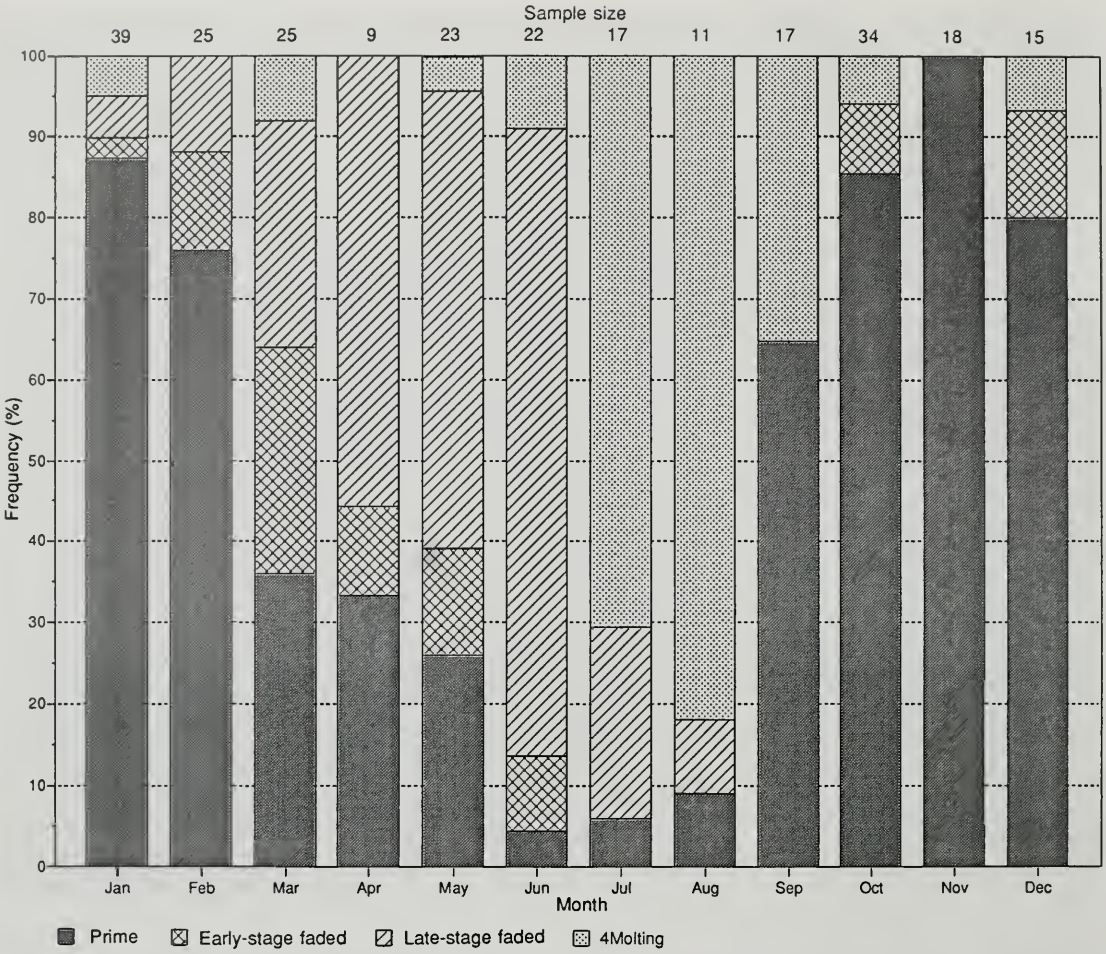

FIG. 4. Monthly incidence of prime, faded, and molting pelage stages in wild-collected specimens of *Macaca mulatta*.

standards; the remaining five, collected in October, November, and month unspecified (one specimen), are slightly less erythristic. The holotype of *Macacus rhesus villosus* (USNM 20120; September) is one of the brightly colored specimens in prime pelage—golden brown anteriorly, becoming burnt orange on the lumbosacral region. In all these specimens, the pelage is notably dense. ISHL is 65 and 70 mm in two adult females and 75 and 85 mm in two adult males (cf. Pocock, 1932, p. 539); MTHL is 40 and 45 mm in two adult females and 40 mm in two adult males. Tails are bushy in all 11.

4. Northeastern Pakistan, ca. 1,400 km northwest of Hazaria Patherghatta; five skins, four localities. One skin (USNM 353186), collected in September, is in prime pelage and is slightly less erythristic than the Nepalese standards. Two skins (BM(NH) 1923.11.4.1; BNHS 5113), collected in June, are late-stage faded. One skin (USNM 353187), collected in August, is in the process of molting; most of the pelage consists of short (30 mm) bright new hairs, but scattered among these are a few long (90 mm) faded old hairs. In the fifth skin (USNM 326332), collected in September, the molt apparently had just been completed; the fur is short (35 mm) and bright, similar in color to that in the Nepalese standards. ISHL is 65 mm in one adult female and 50 and 70 mm in two adult males; MTHL is 30 and 40 in two adult males. In the male in prime pelage, the tail is bushy.

5. Northwestern Pakistan and eastern Afghanistan, ca. 1,600 km northwest of Hazaria Patherghatta; three skins, three localities (including type locality of *Macaca mulatta mcmahoni* Pocock,

1932). These three specimens—one wild-collected and two captives—are the only preserved skins known to have originated at the northwestern limit of distribution of *M. mulatta*. The wild-collected specimen (BM(NH) 1920.6.11.1), an adult male, was taken in early February 1914 in Pakistan near the border with Afghanistan. One of the captives (BM(NH) 1931.1.9.1, skin only) apparently originated in eastern Afghanistan (Pocock, 1932, p. 543); it was received at the Regent's Park Zoological Gardens, London, on 3 April 1906, died there on 19 January 1910, and was cataloged at BM(NH) in 1931. Available information concerning the sex of this specimen is contradictory. Although zoo records and the zoo tag on the skin indicate that the specimen was a male (P. Jenkins, BM(NH), letter, 21 June 1995), BM(NH) records and the museum tag on the skin indicate that it was a female (Pocock, 1932, p. 543); the skull has not been preserved, and my examination of the skin for evidence of sexual characters was inconclusive. Pending further information, the zoo records are regarded as more reliable, and the specimen is considered to be a male; it probably was an adult (cf. Pocock, 1932, p. 543). The other captive (FMNH 102839), a juvenile female that reportedly also originated in eastern Afghanistan, was purchased on 2 November 1965 near Gandahar, Afghanistan, ca. 600 km southwest of the reported place of original capture (Hassinger, 1968, p. 72).

Pelage color is diverse in these three skins. The captive male, which died in January, is in prime pelage—dark golden brown on the dorsal thoracic region and bright burnt orange on the lumbosacral region; the color of the lumbosacral region is similar to that in the Nepalese standards, but the color of the dorsal thoracic region is much darker than in most specimens of *M. mulatta*. The wild-collected male (BM(NH) 1920.6.11.1, holotype of *Macaca mulatta mcmahoni*), taken in February, is yellowish gray anteriorly, becoming washed with burnt orange posteriorly. The shaggy, dull-colored, weakly annulated fur probably indicates that this specimen is early-stage faded; this interpretation differs from that of Pocock (1932, p. 545), who noted that the pelage of this male is similar to that of a late-stage faded specimen (BM(NH) 1923.11.4.1) collected at Patriata, Murree, Pakistan, but concluded that, because BM(NH) 1920.6.11.1 was collected in February, it should be in prime pelage (cf. late-stage faded BM(NH) 1923.9.1.118, India: Kangra Fort, Himachal Pradesh, collected 18 March). The captive juvenile female, obtained in November, is relatively dull-colored—yellowish brown anteriorly, becoming golden brown on the sacral region. This skin is more uniformly brown than most specimens of *M. mulatta*; the texture of the pelage does not suggest that the specimen is seasonally faded. In the adult males, ISHL is 50 and 90 mm, and MTHL is 30 and 50 mm. The tails of the adult males are bushy.

6. India: central Madhya Pradesh and southern Gujarat, ca. 600 to 1,400 km southwest of Hazaria Patherghatta; six skins, four localities. One skin from Gujarat (BM(NH) 1931.1.11.3), collected in 1922–1923, is in prime pelage and is brightly colored but is slightly paler than the Nepalese standards. Another skin from Gujarat (BM(NH) 1931.1.11.2), also collected in 1922–1923 and brightly colored, appears from its disheveled pelage to be early-stage faded. Two skins from Madya Pradesh (BM(NH) 1931.1.11.4–5), collected in April and May, are late-stage faded. The remaining two skins (BM(NH) 1931.1.11.1; BNHS 5107), collected in 1922–1923 and date unknown, are pale juveniles. ISHL is 46.7 ± 2.9 mm in three adult females and 50 mm in one adult male; MTHL is 20.0 ± 0.0 mm in the females and 20 mm in the male.

7. India: southwestern Bihar, western and southern Orissa, and eastern Andhra Pradesh, ca. 600 to 1,300 km south-southwest of Hazaria Patherghatta; seven skins, five localities. One skin (BM(NH) 1928.3.7.4), collected in Orissa in September, is in prime pelage and is similar to the Nepalese standards. Two skins (ZSI Coll. No. OM/DD/30; ZSI, Siddeldar Hill, unnumbered), collected in Orissa and Andhra Pradesh in November and December, are in prime pelage but are distinctly less erythristic than the Nepalese standards. The remaining four skins were collected in Bihar and Orissa in August; of these, three (BM(NH) 1915.4.3.2, 1928.3.7.3; BNHS 5089) were in the process of molting, and one (BM(NH) 1915.4.3.1) is newly molted. The bright new fur in all four is similar in color to that in the Nepalese standards. ISHL is 15 mm in one adult female (molting, new fur), 30 mm in a subadult or adult female (skin only), 50 mm in a subadult or adult male (skin only), and 65 mm in an adult male; MTHL is 20 mm in the subadult or adult female and 30 mm in the subadult or adult male.

8. Bangladesh: Sundarbans and India: Tripura, ca. 700 km southeast of Hazaria Patherghatta; nine skins, three localities. The two specimens from Tripura, an adult male (ZSI Coll. No. TM18) collected in November and a subadult male (ZSI Coll. No. TM4) collected in January, are in prime

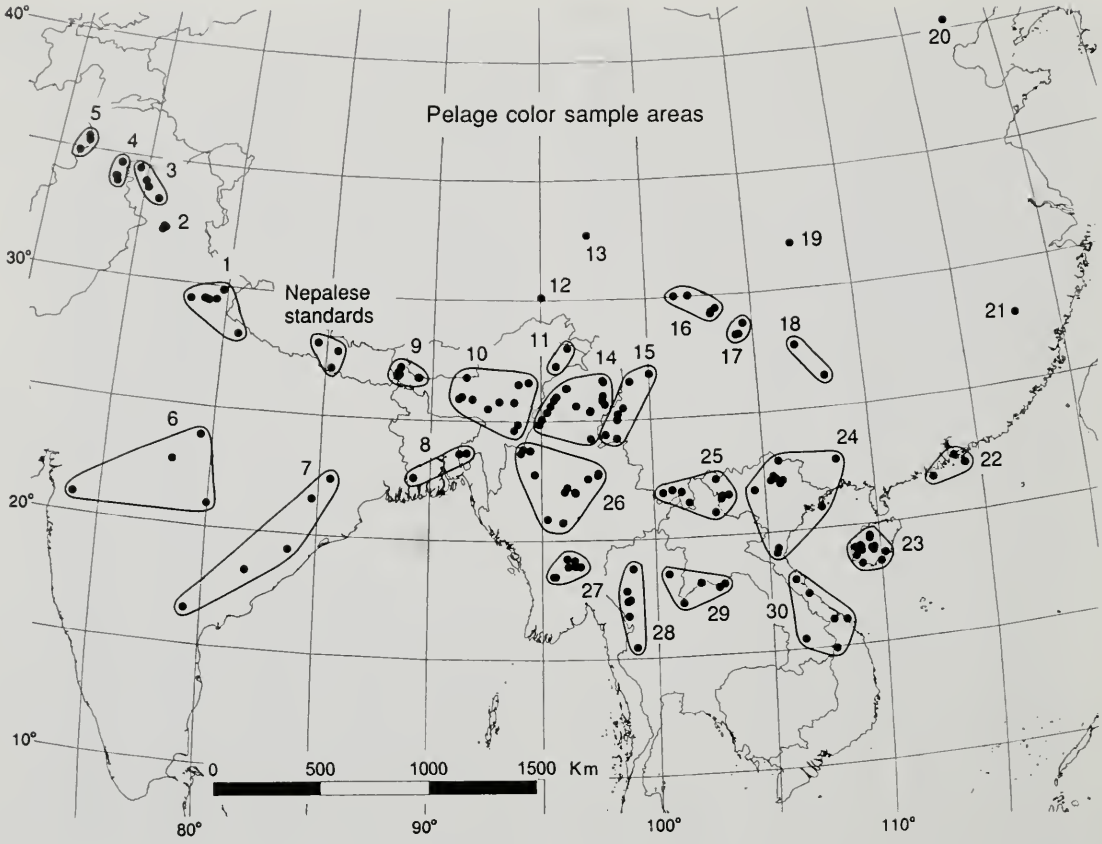

FIG. 5. Sample areas cited in *Macaca mulatta* pelage comparisons. Key to included localities (for details, see Gazetteer, Appendix 2): Nepalese standards—Hazaria Patherghatta; Nagarkot; Chengli. 1. Northern Uttar Pradesh, India—Bageshwar; Dela; Haripur; Jhirna; Rammagar; Ratighat; Sita Bani. 2. Northwestern Himachal Pradesh, India—Dharmsala; Kangra; Samayala. 3. Southwestern Jammu and Kashmir, India—Dunwein; Kashmir; Kotihar; Lolab. 4. Northeastern Pakistan—Dunga Gali vicinity, 2470 m; Ghora Dhaka; Paia; Patriata. 5. Northwestern Pakistan and eastern Afghanistan—Chigha Sarai; Kaotai; Nurestan, eastern. 6. Central Madhya Pradesh and southern Gujarat, India—Dangs; Kakara; Malua; Sohagpur. 7. Southwestern Bihar, western and southern Orissa, and eastern Andhra Pradesh, India—Deogarh; Gudari; Luia; Malkangiri; Siddeldar Hill. 8. Sundarbans, Bangladesh, and Tripura, India—Ampi Bazar; Charilam; Sundarbans, ca. 50 mi east of Calcutta. 9. Sikkim and northern West Bengal, India—Bharnabhari; Hasimara; Mangpu; Narbong; Sikkim; Sivok; Sukna. 10. Assam, Meghalaya, Manipur, and Nagaland, India—Bishenpur; Bogra Nadi; Changchang Pani; Golaghat; Hot Springs; Imphal, ca. 4 mi north of; Kulsi; Lamsakhang; Nangpoh; Samaguting. 11. Arunachal Pradesh, India—Dening; Margherita. 12. Eastern Xizang, China—Yigong, 2250 m. 13. South-central Qinghai, China—Jegu Xiang. 14. Northern Myanmar—Bawmwang; Bhamo; Heinsun; Hisweht; Hkandau; Homalin; Htingnan Triangle; Karen Chaung; Maungkan; Moklok; Nanyaseik; N'Changyang; Singkaling Hkamti (24 July, 5 Aug., and June–Aug. 1914); Taga Hka; Tanga-Shingaw; Tang Hpre; Taro. 15. Western Yunnan, China—Ashi; Biloxue Shan; Datang; Hotha Valley; Hui-yao; Santaishan; Tengchong. 16. West-central Sichuan, China—Gin Keo Ho; Kangding; Leshan; Olongche; Wa Shan. 17. Southeastern Sichuan, China—Tseo-Jia-Geo; Yibin; Yunnan border, south of Yibin. 18. Guizhou, China—Getou; Zunyi. 19. Northeastern Sichuan, China—Tongjiang Xian. 20. Northeastern Hebei, China—Xinglong Xian. 21. Northern Fujian, China—Chong'an Xian; Kuatun. 22. Dawanshan Islands, China—Dangan Dao; Neilingding Dao; Shangchuan Dao (Miwan). 23. Hainan Dao, China—Bawangling; Changtian; Dongfang; Hainan; Henron; Jianfengling; Mihouling; Nada; Nanfeng Shi; Nanwan, Xingcungang; Nychow; Pisui; Wuzhi Shan; Xinlong; Yiajia; Zhayun. 24. Northeastern Vietnam and southern Guangxi, China—Bac Can; Ban Thi; Chiem Hoa; Linh Thong; Ly Bon; Nanning; Nghia Dan; Nghia Dung; Thanh Tuong; Van Hai; Yen Bai. 25. Northern Laos, northwestern Vietnam, and southern Yunnan, China—Lai Chau; Mengla Xian; Menglun; Muong Boum; Muong Muon; Muong Pon; Ou, Nam; Shanman; Xishuangbanna. 26. Central Myanmar—Ali Cha; Kin; Kindat, 20 mi northwest of; Kokkoaing; Lethan Hka; Madaya; Mansam Falls; Maymyo; Mingun; Popa Hill (1000 m; 1512 m); Pyaunggaung; Se-eng; Tatkon, east bank of Chindwin River; Tatkon, west bank of Chindwin River; Yin, east bank of lower Chindwin River; Yin, lower Chindwin River. 27. Southwestern Myanmar—Pye, 30 mi southeast of; Pye 35 mi southeast of; Toungoo, 13 mi east of; Toungoo, 15 mi north of; Toungoo, 20 mi west of; Toungoo, 30 mi northwest of; Toungoo, east side of Sittang River. 28. Northwestern Thailand—Ban Mae Lamao;

pelage but are darker and less erythristic than the Nepalese standards. The adult is dark golden brown anteriorly, becoming strongly washed with burnt orange posteriorly; the subadult is grayish tipped with yellowish anteriorly, becoming faintly washed with burnt orange posteriorly. ISHL is 55 mm in the subadult and 65 mm in the adult.

The seven Sundarbans skins, collected in April 1870, are difficult to interpret. The pelage, which is harsh in texture, is grayish brown to golden brown anteriorly, becoming variably washed with burnt orange posteriorly. The unusual pelage condition may be a result of seasonal fading, deterioration in storage, or both.

Feeroz et al. (1995, p. 75) report that pigmentation of the face and ventral surface in living *M. mulatta* observed at Sitakunda, southeastern Bangladesh, appeared to differ from that in *M. mulatta* observed elsewhere in Bangladesh. No further details concerning this color difference are specified.

9. India: Sikkim and northern West Bengal, ca. 400 km east of Hazaria Patherghatta; 10 skins, seven localities. Eight specimens are in prime pelage. Four of these (BM(NH) 1916.7.29.2, 1931.1.11.9; FMNH 35447, 35448), collected in November–January, are brightly colored—similar to the Nepalese standards; one (FMNH 35449), collected in December, is slightly less erythristic; two (BM(NH) 1891.10.7.4, 1916.7.29.1), collected in January and month unknown, are slightly darker; and one (BM(NH) 1931.1.11.8), collected in February but apparently in prime pelage, is much darker and less erythristic—grayish brown anteriorly, becoming faintly washed with burnt orange on the sacral region. In the remaining two specimens, seasonal fading may have begun. One of these (BM(NH) 1915.9.1.1), collected in March, is paler and has weaker agouti hair banding than the preceding eight specimens; the other (ZSI 7294), collected in April, is drab yellowish brown anteriorly and bright burnt orange posteriorly. ISHL is 45.0 ± 8.7 mm in three adult females and 55.0 ± 5.0 mm in five adult males; MTHL is 20.0 ± 0.0 mm in three adult females and 28.8 ± 6.3 mm in four adult males. The tail is bushy in one adult male (BM(NH) 1891.10.7.4, the only postinfant specimen available from Sikkim).

10. India: Assam, Meghalaya, Manipur, and Nagaland, ca. 600 to 1,000 km east-southeast of Hazaria Patherghatta; 15 skins, 12 localities. Nine specimens in prime pelage, collected August–February, are brightly colored—similar to the Nepalese standards. Two others in prime pelage, a male (ZSI 11187) collected in November and another male (BM(NH) 1943.60) collected in February, are somewhat darker and less erythristic—dark golden brown anteriorly, faintly washed with burnt orange posteriorly; although both of these relatively dull specimens were collected in Manipur, one of the bright specimens (BM(NH) 1943.61) also was collected in that state. One skin (BM(NH) 1931.1.11.15), collected in May, is late-stage faded. Two specimens (BM(NH) 1921.7.9.4; BNHS 5087), collected in July and September, were in the process of molting; the short bright new fur is sparsely covered by long faded old hairs.

The most aberrant specimen in this group is a very dark and dull-colored adult male (BM(NH) 1921.7.9.3) collected on 25 November 1920 at Rajapara, Assam (Fig. 3B). This specimen, which is in prime pelage, is dark yellowish gray anteriorly, becoming faintly washed with burnt orange on the lumbosacral region. Pocock (1932, p. 530) has drawn attention to the striking contrast between this adult male and a brightly colored adult male (BM(NH) 1931.1.11.7; included among nine bright specimens cited above) that was collected 4 days earlier at the same place (Fig. 3B); Pocock cited these two specimens as an illustration of the broad range of individual variation to which pelage color is subject in *M. mulatta*. ISHL is 45 and 60 mm in two adult females and 50.0 ± 8.7 mm in three adult males; MTHL is 20 and 25 mm in two adult females and 20 and 25 mm in two adult males.

11. India: Arunachal Pradesh, ca. 1,100 km east of Hazaria Patherghatta; four skins, two localities. These four skins (BM(NH) 1931.1.11.13–14; BNHS 5086; ZSI 12090), collected in November–April, are similar to the Nepalese standards. In two adult

---

←

Ban Umphang; Chiang Mai; Huai Ap Nang; Huai Kwang Pah; Kaeng Mae Hat. 29. Northeastern Thailand and west-central Laos—Ban Mak Nao; Dan Sai District; Mekong River; Nong Khai; Pang Nam Un. 30. Southern Laos and Central Vietnam—Dak Sut; Ky Son; Song-Ta-Voy; Son Tra Mt., 3.9 km west and 0.3 km south of; Thateng, Muang; Xuan Ninh.

females, ISHL is 50 and 60 mm and MTHL is 20 and 30 mm.

12. China: eastern Xizang, ca. 1,000 km northeast of Hazaria Patherghatta; one skin, one locality. This skin (NWPIB Coll. No. 73066, juvenile female), collected in June, is late-stage faded; the dorsal pelage is gray tipped with golden anteriorly, becoming washed with pale burnt orange posteriorly. The specimen's faded condition hinders comparison with the Nepalese standards. ISHL is 55 mm (juvenile).

13. China: south-central Qinghai, ca. 1,300 km northeast of Hazaria Patherghatta; two skins, one locality. One skin (NWPIB Coll. No. 63167), collected in June, is early-stage faded—gray tipped with golden anteriorly, becoming reddish brown posteriorly; the other (NWPIB 00033), collected in May, is late-stage faded—pale gray tipped with gold anteriorly, becoming weakly washed with burnt orange posteriorly. Seasonal fading in these skins hinders comparison with the Nepalese standards. Both specimens are juvenile males with long hair and bushy tails; ISHL is 65 and 70 mm, and MTHL is 40 and 50 mm.

14. Northern Myanmar, ca. 1,000 to 1,300 km east-southeast of Hazaria Patherghatta; 27 skins, 17 localities. Ten specimens collected in October–March are in prime pelage; four collected in January–May are early-stage faded; five collected in January–April are late-stage faded; and eight collected in July–August were in the process of molting. Of the 10 specimens in prime pelage, seven are brightly colored and generally similar to the Nepalese standards. The remaining three in prime pelage are somewhat deviant: one (BM(NH) 1950.373) is brightly colored but has unusually dark gray hair bases, one (AMNH 112734) is notably paler than the other nine, and one (USNM 279191) has the burnt orange coloration narrowly restricted to an area near the ischial callosities. Of the four early-stage faded specimens, two (BM(NH) 1937.12.3.75, 1937.12.3.77), collected in May, are slightly more erythristic than the Nepalese standards; one (BM(NH) 1950.372), collected in January, is brightly colored but has unusually dark gray hair bases; and one (AMNH 112739), collected in March, is less erythristic. Of the five late-stage faded specimens, three (AMNH 112740, 112741, 114547) were collected in March or April, which is unremarkable; the other two (AMNH 112722, 112723), somewhat incongruously, were collected in January. ISHL is 50.0 ± 6.0 mm in eight adult females and 50 and 65 mm in two adult males (excludes molting specimens); MTHL is 19.3 ± 6.7 mm in seven adult females and 30 and 35 mm in two adult males.

15. China: western Yunnan, ca. 1,500 east-southeast of Hazaria Patherghatta; 13 skins, seven localities. Of nine specimens in prime pelage, eight collected in December (five skins), April (one skin), and month unknown (two skins) are brightly colored—similar to the Nepalese standards; the other specimen (ZSI 11986), collected in July, is somewhat less erythristic. Two skins (AMNH 43084, 43086), collected in April, are late-stage faded, and a hunter's flat skin (KIZ Coll. No. 780417), reportedly taken in October, is molting. One skin (ZSI 619), collected in March–July 1868, has become severely deteriorated in storage. In one adult female, ISHL is 60 mm, and MTHL is 15 mm.

16. China: west-central Sichuan, ca. 1,600 to 1,800 km east-northeast of Hazaria Patherghatta; six skins, five localities (including type locality of *Macacus vestitus* Milne-Edwards, 1892). Four skins collected in February, March, and June are in prime pelage; one (MNHN 1891/388, holotype of *Macacus vestitus*), collected in June or July, is early-stage faded; and one (USNM 241160), collected in July, is late-stage faded. Two of the specimens in prime pelage (RMNH 4585/V67, 4585/W50, March) are similar in color to the Nepalese standards, one (MNHN 1891/387; June) is slightly less erythristic, and one (BM(NH) 1911.9.8.1; February) is darker and more erythristic—rich golden brown anteriorly, becoming dark burnt orange on the lumbosacral region; the last of these is very slightly paler than BM(NH) 1950.373, collected at Bawmwang, northern Myanmar. In the early-stage faded holotype of *Macacus vestitus*, dorsal pelage is pale grayish tipped with golden anteriorly, becoming pale burnt orange on the lumbosacral region. In two adult females, ISHL is 60 and 80 mm, and MTHL is 40 and 50 mm; in one of these (BM(NH) 1911.9.8.1), the tail is bushy, particularly distally.

Three additional specimens, with vague locality information, may also have been collected in or near west-central Sichuan. One of these is BM(NH) 1871.4.21.4, the holotype of *Macacus lasiotus* Gray, 1868. This tailless adult male was a captive that reportedly originated in "Szechuen"; it reached London, via Shanghai, shortly before 15 January 1868 and died on 25 May 1870. It is in prime pelage, dark and strongly erythristic; the dorsal pelage is dark burnt orange anteriorly, becoming intensely burnt orange on the sacral region; ISHL is 65 mm. The nearest match is

BM(NH) 1927.12.1.18 (Bac Can, northeastern Vietnam), which is slightly paler and less erythristic.

The other two specimens possibly collected in west-central Sichuan (MNHN 1892/315, 1894/1432) are of limited value for pelage comparison. The former is late-stage faded, and the latter has suffered severe postmortem deterioration and discoloration. These two specimens were taken in May–July 1890 by the collectors of MNHN 1891/387 and 1891/388 cited above; the only locality information available is "Tibet," which, for the collectors, included part of what is now Sichuan.

17. China: southeastern Sichuan, ca. 1,900 km east of Hazaria Patherghatta; four skins, three localities. Two specimens collected in October and January are in prime pelage, and two (USNM 258183, 258184), collected in February and March, are late-stage faded. Dorsal pelage coloration in the two in prime pelage, both juveniles, is dissimilar and unusual. The younger specimen (USNM 239133; M1), collected in October, is pale but erythristic—pale golden brown anteriorly, becoming intensely burnt orange on the lumbosacral region; the older juvenile (USNM 256669; I1-2, M2), collected in January, is much darker and less erythristic—yellowish brown anteriorly, becoming golden brown on the lumbosacral region. In one adult female, ISHL is 55 mm, and MTHL is 40 mm.

18. China: Guizhou, ca. 2,100 to 2,300 km east of Hazaria Patherghatta; six skins, two localities. Four specimens (BM(NH) 5.66.150–153), collected in May, are late-stage faded, and two (KIZ 03179, 03181), collected in early September, were in the process of molting. Because of fading or molting, these specimens cannot be compared with the Nepalese standards. MTHL is 40 and 45 mm in two adult females; in the latter specimen, the tail is bushy.

19. China: northeastern Sichuan, ca. 2,200 km northeast of Hazaria Patherghatta; two skins, one locality. These two adult females, collected in July, had just begun to molt on their crowns and tails; the dorsal pelage is late-stage faded. In one specimen (SIZ 00001), the upper back is grayish, and the lower back is pale golden brown; in the other (SIZ 00002), the upper back is pale golden brown, and the lower back is golden brown. No comparison can be made with the Nepalese standards. ISHL is 45 and 50 mm.

20. China: northeastern Hebei, ca. 3,200 km northeast of Hazaria Patherghatta; 10 skins, one locality (type locality of *Macacus tcheliensis* Milne-Edwards, [1872]). Five specimens are in prime pelage, four (FMNH 39376, 39377; MNHN 335/381A/1867:557; USNM 240705) appear to be early-stage faded, and one (AMNH 57039) is late-stage faded; the month of collection or death is reliably known for only one of these 10 specimens (BM(NH) 1931.1.7.2, male in prime pelage, received at Regent's Park Zoo 17 August 1880, died 6 March 1881). Of the specimens in prime pelage, BM(NH) 1931.1.7.2 is long-haired and very brightly colored—pale burnt orange anteriorly, becoming intensely burnt orange on the lumbosacral region; this skin is similar in color to BM(NH) 1937.12.3.7.7 (Karen Chaung, northern Myanmar) and is somewhat more erythristic than the Nepalese standards. Another specimen in prime pelage (AMNH 57040) also is strongly erythristic but is much darker—dark golden brown anteriorly, becoming burnt orange posteriorly. The remaining three specimens in prime pelage (AMNH 57042; FMNH 39378; USNM 240704) are darker and less erythristic than the Nepalese standards. The holotype of *Macacus tcheliensis* (MNHN 335/381A/1867:557), which apparently is early-stage faded, is less erythristic than the Nepalese standards—pale golden brown anteriorly, becoming washed with burnt orange on the lumbosacral region. In two adult males, ISHL is 70 mm (both specimens), and MTHL is 30 and 35 mm.

21. China: northern Fujian, ca. 3,300 km east of Hazaria Patherghatta; six skins, two localities (including type locality of *Pithecus littoralis* Elliot, 1909). Three specimens collected in November and May are in prime pelage; one (AMNH 84476), collected in August, was in the process of molting, and two (MNHN 1874/480, 1874/481, Kuatun), collected in November 1873, are severely faded as a result of extended postmortem exposure to light. Of the three specimens in prime pelage, the holotype of *Pithecus littoralis* (BM(NH) 1900.5.8.1; November) is the brightest—pale golden brown anteriorly, becoming washed with burnt orange on the sacral region; the coloration of this specimen, which almost perfectly matches that of BM(NH) 1931.1.11.7 (India: Rajapara, Assam State; Fig. 3B), is similar to that of the Nepalese standards. Another of the specimens in prime pelage (AMNH 84474; May) is slightly less erythristic, and the third (BM(NH) 1898.11.1.29; May) is somewhat darker and less erythristic. ISHL is 40 mm in one adult female (holotype of *Pithecus littoralis*) and 80 mm in one adult male; MTHL is 25 mm in the female and 40 mm in the male; the tail of the female is relatively bushy.

22. China: Dawanshan Islands, South China Sea,

ca. 3,000 km east-southeast of Hazaria Patherghatta; five skins, three localities (including type locality of *Inuus sanctijohannis* Swinhoe, [1867]). One skin (SCIEA Coll. No. 2155), collected in October, is in prime pelage; three (SCIEA Coll. Nos. 2150, 2151, 2153), collected in March and April, are late-stage faded; and one (BM(NH) 1868.12.29.10, holotype of *Inuus sanctijohannis*), collected in month unknown, was in the process of molting. The specimen in prime pelage is brightly colored, similar to the Nepalese standards. Hair length measurements of adults are not available.

23. China: Hainan Dao, ca. 2,700 km southeast of Hazaria Patherghatta; 30 skins, 16 localities (including type locality of *Pithecus brevicaudus* Elliot, 1913). Twenty-one specimens, collected in October–April, are in prime pelage; four (AMNH 27569, 27575, 60038; ZMB A1904.09), collected in October and March, are early-stage faded; and five, collected in March, May, and July, are late-stage faded. Eleven of the 21 specimens in prime pelage (collected October–February) are brightly colored—similar to the Nepalese standards; these bright specimens include AMNH 27577, the holotype of *Pithecus brevicaudus*, which closely matches AMNH 112733 (northern Myanmar: Taro). Seven of the specimens in prime pelage, collected in October–April, are slightly less erythristic than the Nepalese standards. The remaining three (AMNH 27570, October; BM(NH) 1909.7.11.1, October; SCIEA Coll. No. 0089, December) are notably less erythristic than the Nepalese standards. ISHL is 46.2 ± 4.8 mm in four adult females and 45 and 70 mm in two adult males; MTHL is 27.5 ± 2.9 mm in four adult females and 20 and 30 mm in two adult males.

24. Northeastern Vietnam, and China: southern Guangxi, ca. 2,200 to 2,400 km southeast of Hazaria Patherghatta; 20 skins, 11 localities. Six specimens collected in November–January are in prime pelage, eight collected in December–June (7) and month unknown (1) are early-stage faded, one collected in June is late-stage faded, and four collected in October–January have short bright fur and apparently had just completed the molt; a captive (KIZ Coll. No. 631425), obtained in Nanning, China, and kept alive for an unknown period at KIZ, is long-haired and appears somewhat faded. All six specimens in prime pelage were collected in Vietnam; of these, two closely match the Nepalese standards (BM(NH) 1927.12.1.19, Bac Can; ZMVNU 06/3.16.4, Van Hai), two are slightly darker (BM(NH) 1927.12.1.18, Bac Can; IEBR 733 (833)/560/175, Nghia Dung), one is slightly less erythristic (IEBR 33, Ly Bon), and one is notably less erythristic (ZMVNU 167/3.18.14, Chiem Hoa). In adult females, ISHL is 45.0 ± 8.9 mm (n = 8), and MTHL is 24.3 ± 7.9 mm (n = 7); in one adult male, ISHL is 45 mm, and MTHL is 25 mm. The tail is moderately bushy to bushy in four of the females.

25. China: southern Yunnan, northern Laos, and northwestern Vietnam, ca. 1,600 to 1,900 km southeast of Hazaria Patherghatta; 12 skins, nine localities. Three skins (AMNH 87264; FMNH 31766; KIZ Coll. No. 75840), collected in November–May, and two skins (KIZ 03172, 03180), collected in month unknown, are in prime pelage and are brightly colored—similar to the Nepalese standards; one skin (IEBR D3/M37), collected in month unknown, is early-stage faded; one skin (FMNH 31763), collected in May, and two (KIZ 03173, 03174), collected in month unknown, are late-stage faded; and a captive (AMNH 87278), obtained in November 1931, was in the process of molting when it died on 15 June 1932. The remaining two specimens are somewhat aberrant in their dorsal pelage coloration: a juvenile male (KIZ 000150), collected in October, is much less erythristic than the Nepalese standards—grayish tipped with golden anteriorly, becoming pale golden brown posteriorly; and a ?subadult female (KIZ 000153, skin only), collected in November, is more brownish and less erythristic than usual in *M. mulatta*. Hair length measurements of adults are not available.

26. Central Myanmar, ca. 1,000 to 1,300 km southeast of Hazaria Patherghatta; 33 skins, 16 localities. Fifteen specimens collected in September–May are in prime pelage, 15 collected in May–August are late-stage faded, and three (BM(NH) 1914.7.19.1, 1931.1.11.23, 1931.1.11.27), collected in June–July, were in the process of molting. Of the specimens in prime pelage, seven were collected at various localities, and eight were collected at Popa Hill. The seven collected at various localities average slightly paler and less erythristic than the Nepalese standards; one of these (BM(NH) 1931.1.11.26; January) is similar to the Nepalese standards, five are slightly paler and/or less erythristic, and one (BM(NH) 1931.1.11.22; January) is much darker and less erythristic—yellowish gray anteriorly, washed with burnt orange posteriorly. The eight collected at Popa Hill average notably less erythristic than the Nepalese standards; one (BNHS 5106; September) is similar to the Nepalese standards, two (AMNH 163611, 163613; September–October) are slightly paler and less erythristic,

three (AMNH 163612, 163614, BM(NH) 1914.7.19.2; September–October) are more grayish, and two (AMNH 16310, 16315; October–November) are unusual in their strongly mottled (coarsely agouti) pelage. ISHL is 44.6 ± 5.6 mm in 13 adult females and 46.2 ± 9.5 mm in four adult males; MTHL is 21.9 ± 5.9 mm in eight adult females and 23.3 ± 2.9 mm in three adult males.

27. Southwestern Myanmar, ca. 1,400 km southeast of Hazaria Patherghatta; 10 skins, seven localities. Of seven skins in prime pelage, two (BM(NH) 1931.1.11.20-21), collected in September and October, are similar to the Nepalese standards, and five, collected in November–February, are somewhat less erythristic. One of two skins collected at Toungoo in May (BM(NH) 1931.1.11.18) is early-stage faded—somewhat paler than the Nepalese standards, and the other (BM(NH) 1931.1.11.19) is late-stage faded. Unaccountably, the skin of an early juvenile (BM(NH) 1931.1.11.17), collected near Toungoo in December, also is faded—pale yellowish brown anteriorly, becoming faintly washed with burnt orange on the sacral region (cf. Pocock, 1932, p. 533). ISHL is 43.0 ± 5.7 mm in five adult females; MTHL is 18.3 ± 2.9 mm in three adult females.

28. Northwestern Thailand, ca. 1,700 to 2,000 km southeast of Hazaria Patherghatta; six skins, six localities (including type locality of *Macaca siamica* Kloss, 1917). Only one of these skins (ZRC 4–154), month of collection unknown, is in prime pelage; this bright skin is similar to the Nepalese standards. Three skins (CTNRC, catalog number unknown; FMNH 99668; ZRC 4–188, holotype of *Macaca siamica*), collected in March–April, are early-stage faded, and one (FMNH 99669), collected in March, is late-stage faded. One skin (AMNH 54816, subadult male), collected in early February, appears to have been in the process of molting; this does not accord with the late summer molting schedule that generally applies in *M. mulatta*. ISHL is 50 mm in one adult female and 50 and 70 mm in two adult males; MTHL is 25 mm in one adult female and 35 mm in one adult male.

29. Northeastern Thailand and west-central Laos, ca. 1,800 to 2,100 km southeast of Hazaria Patherghatta; eight skins, five localities. Five skins, collected in January–March and month unknown (one specimen), are in prime pelage; of these, three (USNM 300017; ZRC 4–150, 4–151), collected in February–March, are brightly colored—similar to the Nepalese standards, and two (USNM 296917, 307716), collected in January and month unknown, are somewhat less erythristic. One skin (ZRC 4–152), collected in February, is early-stage faded; one (USNM 307715), collected in month unknown, is late-stage faded; and one (USNM 240488), collected in July, was molting. ISHL is 45 mm in two adult females and 45.0 ± 5.0 mm in three adult males; MTHL is 20 mm in one adult female and 25 mm in one adult male.

30. Southern Laos (one locality) and central Vietnam, ca. 2,800 km southeast of Hazaria Patherghatta; nine skins, six localities. Dorsal pelage color is highly variable in these specimens, all of which appear to be in prime pelage. One skin (IEBR 560/3, ?adult male, Xuan Ninh) is golden brown anteriorly and burnt orange posteriorly, similar to the Nepalese standards. Two others (USNM 356968, subadult female, Mt. Sontra; USNM 320780, adult female, Dak Sut) are almost uniformly golden brown anteriorly and posteriorly, approximately as in *M. fascicularis* (cf. Fooden, 1995, p. 25; 1997, p. 227); these two specimens are now allocated to *M. mulatta* solely on the basis of their relative tail length (USNM 356968, 59.7%; USNM 320780, 64.5%). In the remaining six skins, dorsal pelage color is slightly brighter posteriorly than anteriorly, variably intermediate between that in typical *M. mulatta* and *M. fascicularis* (IEBR 40, ?adult male, Ky Son; MNHN 1899/54, adult female, Song Ta-Voy; ANSP 15135, juvenile female, and ANSP 15138, juvenile, Muang Thateng, Laos; USNM 320781, adult female, and USNM 320782, juvenile male, Dak Sut). In two adult females, ISHL is 65 mm, and MTHL is 10 and 15 mm; in two ?adult males, ISHL is 50 mm, and MTHL is 30 and 40 mm.

SUMMARY—Judging from specimens examined, there is no general pattern of geographic variation in dorsal pelage color in *M. mulatta*. Of 166 postinfantile specimens in prime pelage from 30 sample areas, 78 are similar in color to the Nepalese standards, 55 are variably less erythristic, and 33 from scattered sample areas are either more erythristic, darker, paler, browner, or more mottled. Individual variation is great among specimens from the same sample area and even from the same locality; this is vividly demonstrated by the two contrastingly colored adult males collected 4 days apart at Rajapara, Assam, India (Fig. 3B). Conversely, specimens from widely separated parts of the specific range may be nearly identical in color, as illustrated by the following examples of matching pairs: USNM 326332, Gora Dhaka, Pakistan, and USNM 240175, Ashi, Yunnan, China; FMNH 35448, Mangpu, Sikkim, India, and FMNH 31766, Muong Boum, Viet-

nam; BM(NH) 1931.1.11.7, Rajapara, Assam, India, and BM(NH) 1900.5.8.1, Kuatun, Fujian, China; AMNH 112733, Taro, Myanmar, and AMNH 27577, Wuzhi Shan, Hainan, China; AMNH 112732, Taro, Myanmar, and AMNH 57043, Xinglong Xian (= Eastern Tombs), Hebei, China; and BM(NH) 1931.1.11.17, Toungoo, 30 mi northwest, Myanmar, and BM(NH) 1870.7.18.19, Nychow, Hainan, China.

Limited available evidence suggests that specimens from northwestern Pakistan and eastern Afghanistan (Sample Area No. 5), Tripura, India (No. 8), and China, northeastern Hebei (No. 20) may tend to average somewhat darker than usual in *M. mulatta* and that specimens from central Myanmar (No. 26) and southwestern Myanmar (No. 27) may tend to average somewhat less erythristic. Dorsal pelage color in southern Laos and central Vietnam (No. 30) is transitional between that in typical *M. mulatta* and neighboring *M. fascicularis*.

ISHL averages greater in the northern part of the geographic range of *M. mulatta*, north of ca. 28°N latitude, than in the southern part of the range (Fig. 6). MTHL, which presumably is correlated with perceived bushiness of the tail, also averages greater in the northern part of the range (Fig. 7; cf. Roonwal & Tak, 1981, p. 96; Tak & Kumar, 1984, p. 203).

In the original description of *Macacus lasiotus* Gray, 1868 (p. 61), hairiness of the ears is casually cited as a diagnostic character of rhesus macaques in Sichuan, China (cf. Jiang Xuelong et al., 1991, p. 244). This appears to be invalid, as indicated by the following list of BM(NH) specimens of *M. mulatta* in which hairiness of the ears equals or exceeds that in the holotype of *Macacus lasiotus* (BMNH 1871.4.21.4): Afghanistan—1931.1.9.1; Myanmar—1931.1.11.21, 1931.1.11.24; China, Fujian—1900.5.8.1; China, Hubei—1931.1.7.2; India, Assam—1921.7.9.4; India, Jammu and Kashmir—1871.3.3.5; India, Sikkim—1891.10.7.4; India, Uttar Pradesh—1914.7.10.2, 1914.7.10.4; India, West Bengal—1916.7.29.1; Nepal—1921.5.1.2; Pakistan—1920.6.11.1, 1923.11.4.1; and Vietnam—1927.12.1.19, 1927.12.1.20, 1928.7.1.11.

External Measurements and Proportions

Sex and Age Variation

In wild-collected adult *M. mulatta* specimens examined, mean head and body length in 48 males (531.8 mm) is 13% greater than in 72 females (468.8 mm), and mean body weight in 25 males (7.70 kg) is 44% greater than in 33 females (5.34 kg) (Table 2). Relative length of the tail, hindfoot, and ear in adult females is similar to relative length of these appendages in adult males. From infancy to adulthood, relative length of these appendages declines, indicating that the postnatal growth rate of the appendages is less than that of the head and body (cf. Schultz, 1933, p. 12; Lumer & Schultz, 1941, p. 284). The 33% decline in relative ear length from infancy to adulthood is particularly striking.

Abundant and detailed data are available concerning age variation of external measurements in captive *M. mulatta* (Hartman, 1932, p. 23; Schultz, 1933, p. 12; 1937, p. 75; van Wagenen & Catchpole, 1956, p. 248; Pickering & Kontaxis, 1961, p. 270; Kirk, 1972, p. 573; Gavan & Hutchinson, 1973, p. 71; Kerr et al., 1974, p. 224; Cupp & Uemura, 1981, p. 113; Gribnau & Geijsberts, 1981, p. 6; Rawlins et al., 1984, p. 254; Riopelle et al., 1986, p. 910; Sharma & Lal, 1986, p. 143; Turnquist & Kessler, 1989, p. 8; DeRousseau, 1990, p. 288; Saxton & Lotz, 1990, p. 128; Gavan, 1991, p. 583; Zeng, 1992, p. 18; Zlámalová et al., 1994, p. 198; 1995, p. 43; Johnson & Kapsalis, 1995a, p. 346; Vančata et al., 1995, p. 32; Blackwelder & Golub, 1996, p. 451; Clarke & Snyder, 1996, p. 86; Champ et al., 1996, p. 487; Hudson et al., 1996, p. 198; Maity & Rathore, 1998, p. 247; Clarke & O'Neil, 1999, p. 340). In captives, sitting height—which is comparable to head and body length as measured in wild-collected specimens—increases from infancy to age ca. 7 to 9 years, remains fairly constant for the next 10 to 20 years and tends to decline slightly in old age; body weight similarly increases to a plateau and ultimately declines in old age. Nursery-reared infants gain weight more rapidly than mother-reared infants (van Wagenen & Catchpole, 1956, p. 249; Champoux et al., 1989, p. 115; Kriete et al., 1995, p. 16), and captive adults generally weigh more than wild-collected adults (cf. Table 2; Rawlins et al., 1984, p. 253).

Smith (1994c, p. 282) reports that, in captivity, weight gain from age 1 year to age 4 years is more rapid in hybrid Chinese-Indian *M. mulatta* than in nonhybrid Indian *M. mulatta*.

Geographic Variation

HEAD AND BODY LENGTH—Collectors' measurements of head and body length in *M. mulatta* are

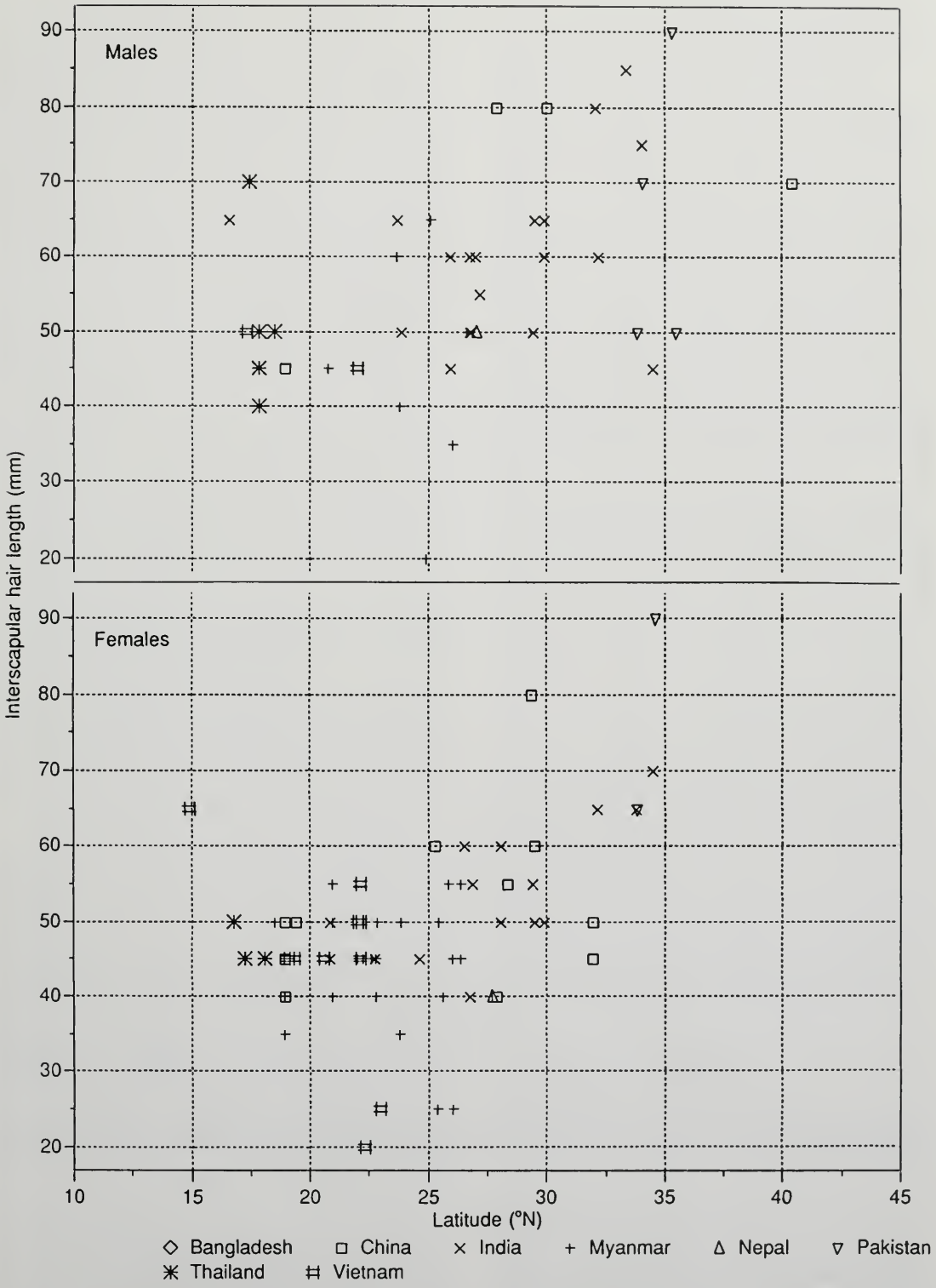

FIG. 6. Latitudinal variation in interscapular hair length in *Macaca mulatta* adults. In this graph, the measurement for one Afghan male (50 mm) is included with Pakistani data, and the measurement for one Laotian female (45 mm) is included with Thai data; measurements of interscapular hair length are not available for Bangladeshi adults.

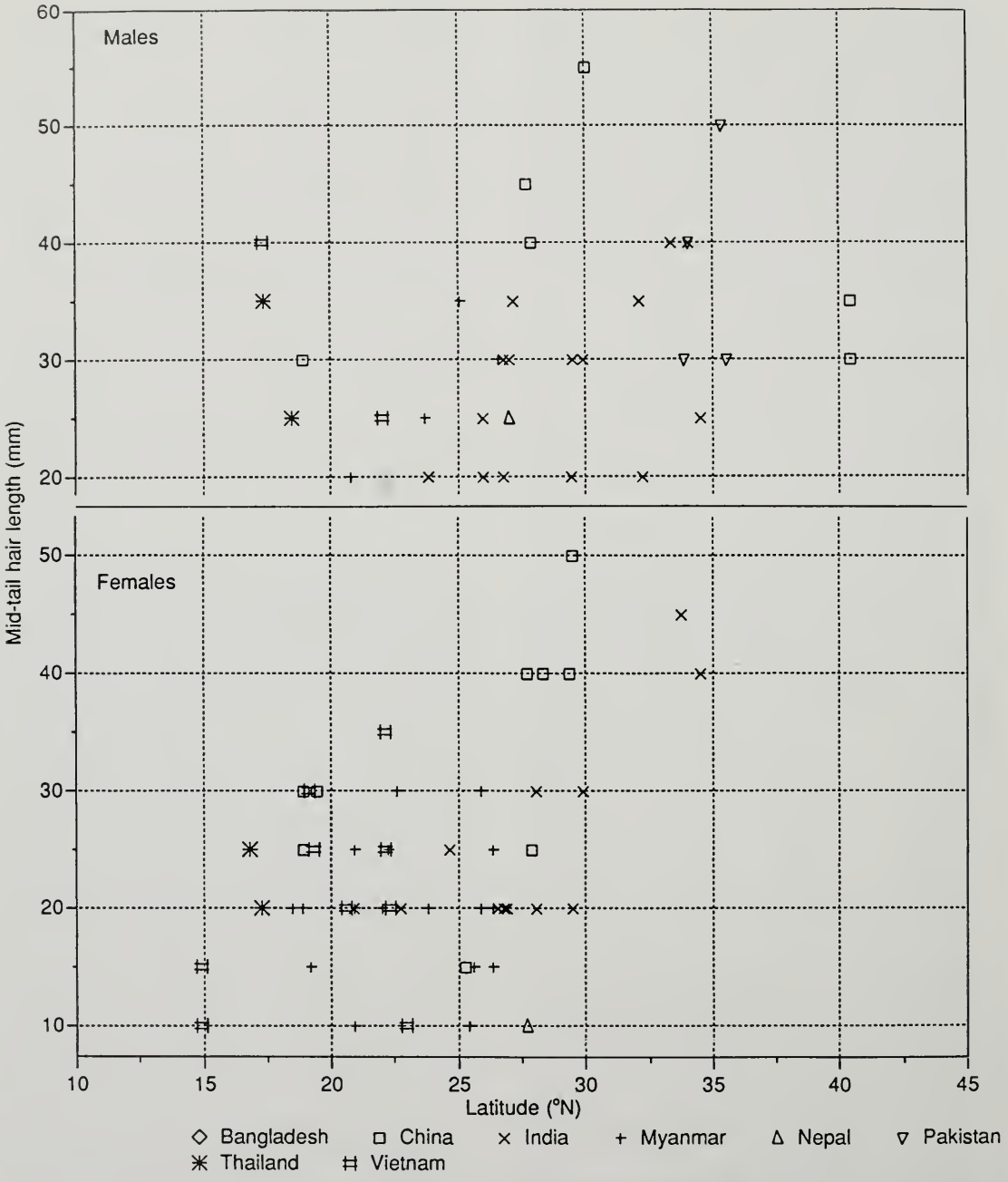

FIG. 7. Latitudinal variation in midtail hair length in *Macaca mulatta* adults. In this graph, the measurement for one Afghan male (30 mm) is included with Pakistani data; measurements of midtail hair length are not available for Bangladeshi adults.

available for 120 adult specimens—72 females and 48 males—collected at 93 localities (Table 3). Although these data are invaluable, some inter-collector variation in measurement techniques is inevitable and must be borne in mind.

Head and body length in both sexes tends to increase with latitude (Fig. 8, Table 3), in accord with Bergmann's rule (cf. Mayr, 1963, p. 319). However, the relationship between head and body length and latitude is not as close as that between

greatest length of skull and latitude (Fig. 17, Table 9). In particular, head and body length is aberrantly large, relative to latitude, in one male collected in peninsular India (15°–20°N, 75°–80°E), near the southwestern limit of the specific range, and in 12 females and 6 males collected in southeastern China and northern Vietnam (15°–25°N, 105°–110°E), near the southeastern limit of the specific range; the aberrant group of northern Vietnamese specimens includes one large female and two large males collected on Dao Cat Ba, an island in the Gulf of Tonkin, South China Sea (Fig. 8). Head and body length is small, relative to latitude, in one female collected on Neilingding Dao and one male collected on Dangan Dao, two Chinese islands in the South China Sea (Fig. 8).

Jiang Haisheng et al. (1991, p. 210) compared "body length" in samples of Chinese *M. mulatta* from Hainan Dao (ca. 18°30′N, island) and Guangxi (ca. 23°N, mainland). Although body length in the Hainan Dao sample is less than in the Guangxi sample, the significance of this finding is acknowledged by the authors to be questionable because no information is available concerning whether measured specimens were immatures or adults. In one adult female collected on Hainan Dao that is included in the present study, the relationship between head and body length and latitude does not appear unusual (Fig. 8). Krishnan (1972, p. 541) indicates, without documentation, that body size is reduced in a population of *N. mulatta* at Jaldapara Wildlife Sanctuary, northeastern India.

Crown-rump length in *M. mulatta* captives imported from China has been compared with crown-rump length in *M. mulatta* captives descended from monkeys imported from India (Clarke & O'Neil, 1999, pp. 340, 341). In males, crown-rump length in Chinese-origin adults equaled that in Indian-derived adults; in females, crown-rump length in Chinese-origin adults was less than that in Indian-derived adults. No information is available concerning the region of origin of these monkeys within India or China.

Tail Length—Collectors' measurements of tail length are available for 120 adult specimens of *M. mulatta* (Table 4; see "Head and Body Length," p. 26). Mean tail length (±SD) is 207.6 ± 32.72 mm in 72 adult females and 228.9 ± 35.78 mm in 48 adult males.

Tail length is aberrantly large (289 mm, 298 mm) in two adult females collected in central Vietnam (10°–15°N, 105°–110°E; Dak Sut), at the southeastern border of the species geographic range. These two outlier specimens have previously been interpreted as evidence of hybridization between *M. mulatta* and *M. fascicularis* (Fooden, 1996, p. 859; 1997, p. 228).

Excluding the two aberrant Dak Sut females, tail length apparently tends to increase slightly with latitude (Fig. 9; cf. Roonwal & Tak, 1981, p. 98). More conspicuously, tail length tends to decrease with longitude, particularly east of ca. 95°E (Fig. 10); marking the eastern end of this west-east cline are six short-tailed specimens collected on four shallow-water islands—Cat Ba, Dangan Dao, Hainan Dao, Neilingding Dao—in the South China Sea (105°–115°E) and two short-tailed specimens collected in Fujian Province on the Chinese mainland (115°–120°E). The shortness of the tail in specimens collected on Hainan Dao and in Fujian was previously noted by Elliot (1909, p. 250) and Jiang Haisheng et al. (1991, p. 210).

Although the tail in *M. mulatta* is shorter than in most other monkeys, it retains an important function in intraspecific communication. Tail carriage serves as a signal of dominance status both in natural populations (Neville, 1968c, p. 15; Lindburg, 1971, p. 60; Ojha, 1974, p. 164; Roonwal & Tak, 1981, p. 96; Wada, 1984, p. 492) and in captive colonies (Altmann, 1962, p. 378; Sade, 1967, p. 101; 1971, p. 294; Waterhouse & Waterhouse, 1976, p. 87; cf. Rodriguez, 1998, abstract no. 307). In captivity, the tail may also function as a rudimentary prehensile organ (Erwin, 1974, p. 130). Preliminary observations in northern India suggest that tail carriage may vary geographically (Roonwal & Tak, 1981, p. 96; Tak & Kumar, 1984, p. 203).

Relative Tail Length—Relative tail length, the ratio of tail length to head and body length (T/HB), is a measure of the functional and perceived length of the tail. Geographic variation in this ratio is given separate treatment here because variation in tail length in *M. mulatta* is not entirely congruent with variation in head and body length (see above). This ratio is available for 120 wild-collected adult specimens (see "Head and Body Length," p. 26). Because relative tail length is similar in females and males (Table 2; Fooden, 1997, p. 223), mixed-sex samples are used in the present analysis.

Latitudinal variation in relative tail length in *M. mulatta* is relatively minor (Fig. 11, Table 5; Fooden, 1997, p. 225), excluding two aberrant specimens collected in central Vietnam (ca. 15°N; see "Tail Length," above). Longitudinal variation

TABLE 2. External measurements and proportions in age/sex classes of wild-collected *Macaca mulatta*.[1]

Age/sex class[2]	Head and body length (mm)	Relative tail length (T/HB × 100)	Relative hindfoot length (HF/HB × 100)	Relative ear length (E/HB × 100)	Weight[3] (kg)
Infants	284.2 ± 58.6 170–387 (*25*)	46.8 ± 9.9 28.7–62.3 (*24*)	34.2 ± 5.0 25.5–45.3 (*24*)	12.1 ± 2.1 9.4–17.6 (*19*)	1.24 ± 0.75 0.43–2.30 (*8*)
Juveniles	406.2 ± 67.3 265–620 (*88*)	46.4 ± 8.9 27.8–74.0 (*86*)	32.7 ± 5.3 23.1–65.0 (*80*)	9.1 ± 1.9 4.9–14.7 (*77*)	3.19 ± 1.51 1.30–8.35 (*47*)
Subadults	—	45.4 ± 7.1 32.1–59.7 (*34*)	30.1 ± 3.4 21.2–36.9 (*31*)	7.9 ± 1.3 5.4–10.3 (*26*)	—
Subadult females	453.5 ± 50.6 385–530 (*10*)	48.0 ± 8.9 32.8–59.7 (*10*)	30.9 ± 3.5 26.3–36.9 (*9*)	8.6 ± 1.2 7.2–10.3 (*8*)	4.66 ± 0.28 4.50–4.99 (*3*)
Subadult males	525.6 ± 43.2 440–597 (*24*)	44.3 ± 6.1 32.1–56.0 (*24*)	29.7 ± 3.3 21.2–34.3 (*22*)	7.7 ± 1.4 5.4–10.1 (*18*)	7.69 ± 2.75 4.76–15.42 (*17*)
Adults	—	44.4 ± 8.9 20.0–72.1 (*120*)	30.0 ± 3.1 19.3–35.7 (*108*)	8.0 ± 1.2 4.8–11.9 (*103*)	—
Adult females	468.8 ± 49.1 370–580 (*72*)	45.0 ± 9.6[4] 27.8–72.1 (*72*)	30.0 ± 3.2 19.3–35.5 (*65*)	8.1 ± 1.1 5.2–10.3 (*61*)	5.34 ± 1.34 3.00–9.98 (*33*)
Adult males	531.8 ± 55.2 410–660 (*48*)	43.5 ± 7.9[4] 20.0–62.0 (*48*)	29.9 ± 3.1 21.6–35.7 (*43*)	7.9 ± 1.3 4.8–11.9 (*42*)	7.70 ± 2.33 4.01–14.06 (*25*)

[1] Mean ± SD, extremes, and sample size (italicized figures in parentheses).

[2] Dental specifications: infants, deciduous teeth only; juveniles, some permanent teeth erupted; subadults, M3 in females or C in males incompletely erupted; adults, all permanent teeth completely erupted.

[3] These data are uncontrolled for seasonal weight variation, which has been reported both in females and in males in natural populations (Lindburg, 1977b, p. 247; Pearl et al., 1987, p. 36; cf. Small, 1981, p. 93; Zeng, 1992, p. 22).

[4] These values differ slightly from those published previously (Fooden, 1997, p. 224) because of inclusion here of data for specimens with intermediate relative tail length (60%–75%) and exclusion here of data for specimens that had been held in captivity prior to collection.

in relative tail length in the western half of the geographic range also is relatively minor (Fig. 12, Table 5); from Pakistan (ca. 73°E) to Myanmar (ca. 95°E), mean relative tail length is 46.7 ± 7.0% (SD; extremes, 31.9%–62.0%; n = 68). East of Myanmar, in the northeastern part of the range (northern Vietnam, China), relative tail length tends to decline from west to east, reaching ca. 30% at 120°E; six specimens collected on four islands in the South China Sea are included in this cline. Conversely, relative tail length increases in the extreme southeastern part of the range; in Thailand and Laos (ca. 100°E), mean relative tail length is 53.0% ± 4.9% (extremes, 47.5%–60.8%; n = 8), and in the two aberrant specimens collected in central Vietnam, relative tail length is 64.5% and 72.1%. High relative tail length in these southeastern specimens may be interpreted as further evidence of hybridization between *M. mulatta* and *M. fascicularis* (see "Tail Length," p. 29).

Judging from dry-skin measurements and a published illustration (Table 6; Milne-Edwards, [1870], pl. 32; Pocock, 1932, p. 550), relative tail length apparently was low (?30% in adults) in the now-extinct population that formerly inhabited Xinglong Xian (= Eastern Tombs; ca. 40°24′N, 117°30′E), northeastern China (cf. Zhang Yongzu et al., 1989, p. 380). This would be in accord with the pattern of longitudinal variation in relative tail length indicated above (cf. Fig. 11).

BODY WEIGHT—Body weight data are available for 33 wild-collected adult females and 25 wild-collected adult males (Table 7). Weight, like head and body length, tends to increase with latitude (Fig. 13); at 30° to 35°N, mean weight (females, 7.45 kg, n = 5; males, 12.48 kg, n = 2) is approximately twice that at 15° to 20°N (females,

TABLE 3. Geographic variation in head and body length (mm) in adult *Macaca mulatta*. First line in each cell (5-degree latitude–longitude block) indicates mean and standard deviation (where sample size is greater than two), second line indicates extremes, and third line indicates sample size (italicized, in parentheses).

Latitude (°N)	Longitude (°E)									
	70–75	**75–80**	**80–85**	**85–90**	**90–95**	**95–100**	**100–105**	**105–110**	**110–115**	**115–120**
					Adult females: 469 ± 49, 370–580, (*72*)					
30–35	510 495–525 (*2*)	580 (*1*)					550 (*1*)	510 (*1*)		
25–30		468 460–475 (*2*)		470 ± 60 400–533 (*4*)	450 (*1*)	451 ± 37 405–515 (*13*)	480 472–489 (*2*)	451 432–470 (*2*)		
20–25		465 (*1*)		430 (*1*)	462 ± 39 420–510 (*5*)	478 ± 28 432–520 (*9*)	485 ± 54 430–560 (*4*)	519 ± 37 475–580 (*9*)	440 (*1*)	
15–20						404 ± 25 370–440 (*6*)	392 390–395 (*2*)	493 ± 56 452–557 (*3*)		
10–15								432 401–462 (*2*)		
					Adult males: 532 ± 55, 410–660, (*48*)					
30–35	583 ± 41 559–630 (*3*)	559 ± 74 500–660 (*4*)								
25–30		526 ± 22 510–555 (*5*)		499 ± 40 460–540 (*4*)	540 540–540 (*2*)	514 508–520 (**2**)		600 (*1*)		561 522–600 (*2*)
20–25		515 (*1*)			534 ± 40 480–575 (*4*)	554 550–559 (*2*)	521 ± 62 448–619 (*5*)	581 ± 34 550–625 (*4*)	440 (*1*)	
15–20		590 (*1*)				494 492–495 (*2*)	423 ± 15 410–440 (*3*)	556 508–603 (*2*)		

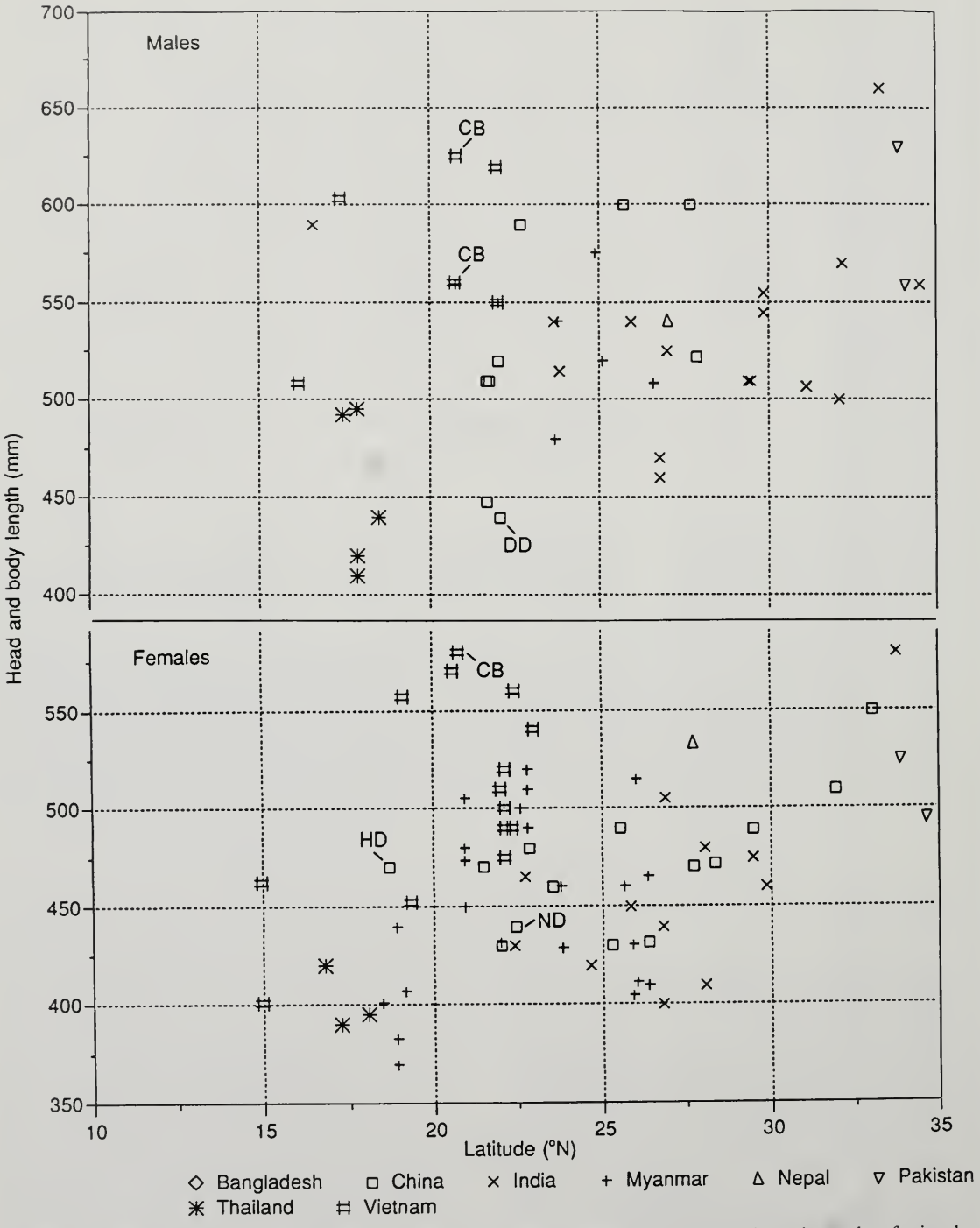

FIG. 8. Latitudinal variation in head and body length in *Macaca mulatta* adult noncaptives; data points for insular specimens are indicated by two-letter abbreviations (CB = Cat Ba; DD = Dangan Dao; HD = Hainan Dao; ND = Neilingding Dao). In this graph, the measurement for one Laotian female (395 mm) is included with Thai data; measurements of head and body length are not available for Bangladeshi adults.

TABLE 4. Geographic variation in tail length (mm) in adult *Macaca mulatta*. First line in each cell (5-degree latitude–longitude block) indicates mean and standard deviation (where sample size is greater than two), second line indicates extremes, and third line indicates sample size (italicized, in parentheses).

Latitude (°N)	Longitude (°E)									
	70–75	**75–80**	**80–85**	**85–90**	**90–95**	**95–100**	**100–105**	**105–110**	**110–115**	**115–120**
					Adult females: 208 ± 33, 125–298, (*72*)					
30–35	231 225–237 (*2*)	185 (*1*)					180 (*1*)	188 (*1*)		
25–30		232 215–250 (*2*)		222 ± 8 210–229 (*4*)	205 (*1*)	207 ± 31 165–280 (*13*)	235 211–260 (*2*)	163 150–176 (*2*)		
20–25		212 (*1*)		215 (*1*)	233 ± 10 220–241 (*5*)	199 ± 18 178–225 (*9*)	180 ± 31 155–220 (*4*)	191 ± 23 160–220 (*9*)	125 (*1*)	
15–20						232 ± 11 218–245 (*6*)	225 210–240 (*2*)	170 ± 18 155–190 (*3*)		
10–15								294 289–298 (*2*)		
					Adult males: 229 ± 36, 125–310, (*48*)					
30–35	269 ± 36 229–300 (*3*)	262 ± 34 228–310 (*4*)								
25–30		253 ± 26 220–286 (*5*)		227 ± 25 200–260 (*4*)	222 220–225 (*2*)	266 250–282 (*2*)		220 (*1*)		168 147–190 (*2*)
20–25		218 (*1*)			229 ± 25 210–263 (*4*)	214 200–229 (*2*)	218 ± 28 185–245 (*5*)	192 ± 47 125–235 (*4*)	158 (*1*)	
15–20		260 (*1*)				234 234–235 (*2*)	222 ± 18 205–240 (*3*)	226 222–230 (*2*)		

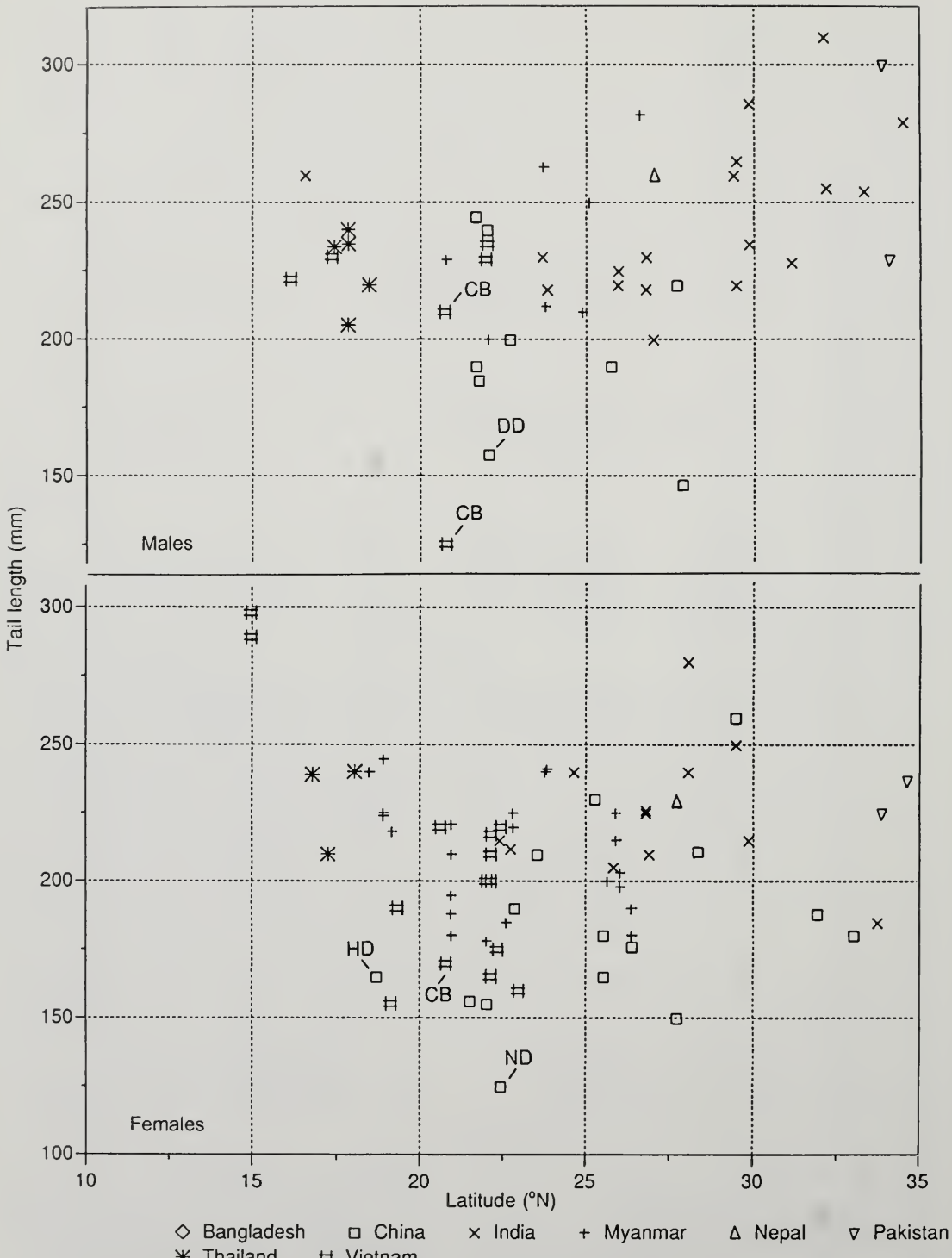

FIG. 9. Latitudinal variation in tail length in *Macaca mulatta* adult noncaptives; data points for insular specimens are indicated by two-letter abbreviations (CB = Cat Ba; DD = Dangan Dao; HD = Hainan Dao; ND = Neilingding Dao). In this graph, the measurement for one Laotian female (240 mm) is included with Thai data; measurements of tail length are not available for Bangladeshi adults.

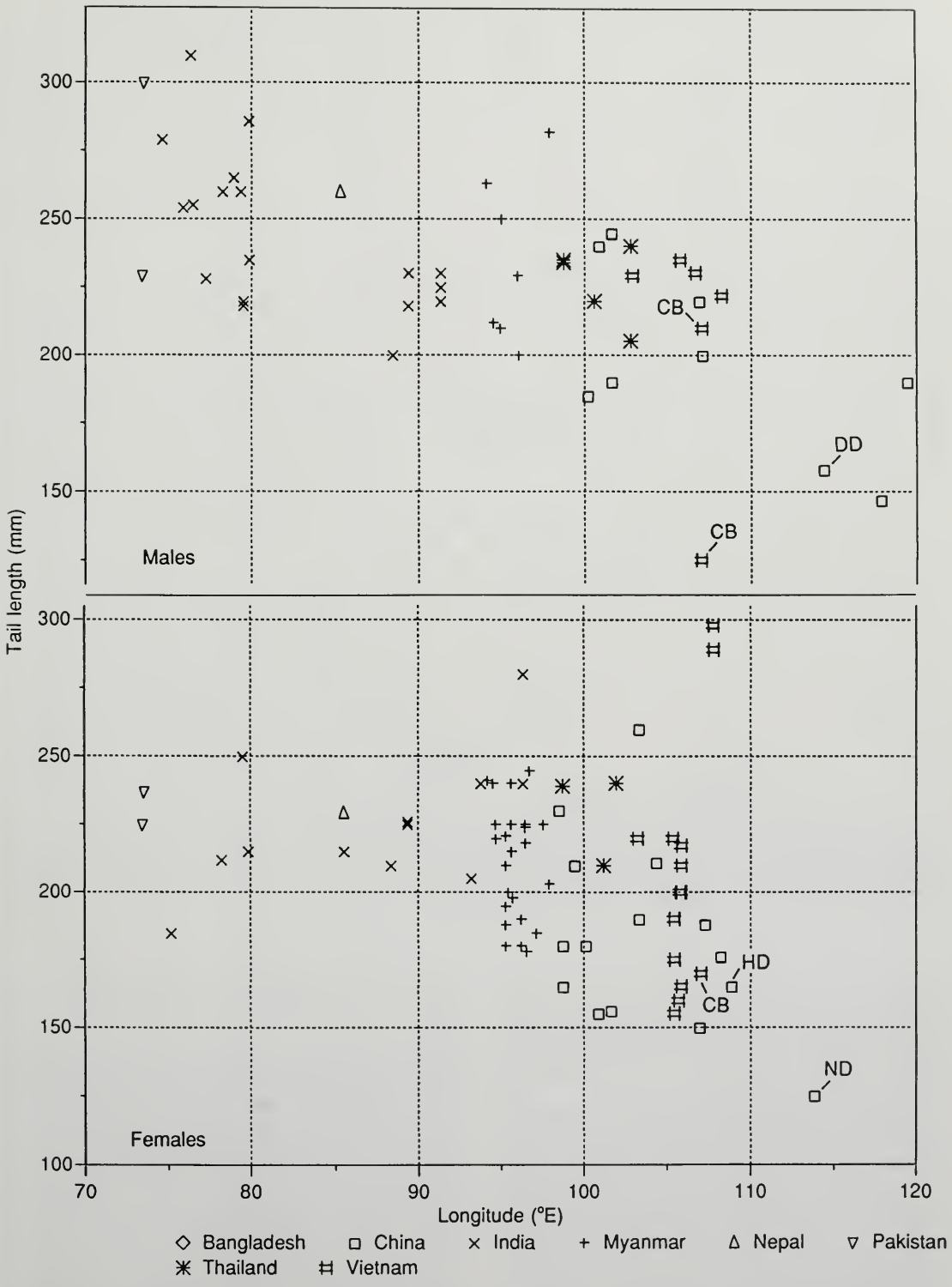

FIG. 10. Longitudinal variation in tail length in *Macaca mulatta* adult noncaptives. For detailed comments, see Figure 9.

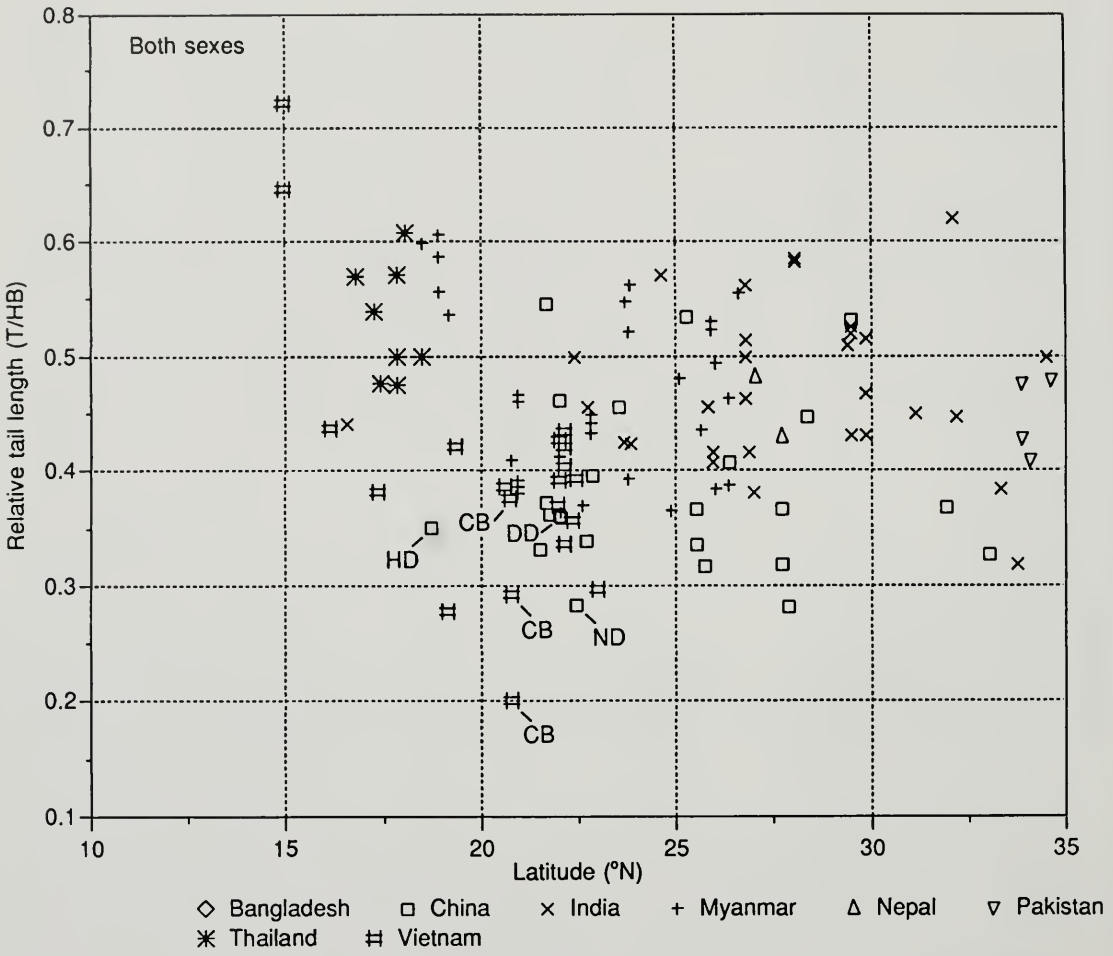

FIG. 11. Latitudinal variation in relative tail length (tail length/head and body length) in *Macaca mulatta* adult noncaptives; data points for insular specimens are indicated by two-letter abbreviations (CB = Cat Ba; DD = Dangan Dao; HD = Hainan Dao; ND = Neilingding Dao). In this graph, the value for one Laotian female (0.61) is included with Thai data; values are not available for Bangladeshi adults.

4.27 kg, n = 4; males, 6.14 kg, n = 3). Data points for specimens collected on four shallow-water islands (Cat Ba, Dangan, Hainan, Neilingding) in the South China Sea fit well within the latitudinal body weight cline.

Weights previously reported for *M. mulatta* in Hainan Dao (18°23′N, 110°00′E) and northern Pakistan (34°03′N, 73°22′E) are similar to those of specimens examined from the same latitudes (Fig. 13). For Hainan Dao specimens of unknown maturity, Jiang Haisheng et al. (1991, p. 210) reported that mean weight was 3.88 ± 0.20 kg in 33 females and 5.08 ± 0.72 kg in 16 males. In northern Pakistan, Pearl et al. (1987, p. 36) reported that mean weight of adult females was 7.3 kg and that the weight of a large male was 11.9 kg.

Body weight in *M. mulatta* captives imported from China has been compared with body weight in *M. mulatta* captives descended from monkeys imported from India (Clarke & O'Neil, 1999, pp. 340, 341; see "Head and Body Length," p. 26). In males, body weight in Chinese-origin adults exceeded that in Indian-derived adults; in females, body weight in Chinese-origin adults was less than that in Indian-derived adults. As previously indicated, no information is available concerning the region of origin of these monkeys within India or China.

TABLE 5. Geographic variation in relative tail length (tail length/head and body length; %) in adult *Macaca mulatta*, females and males (cf. Table 2). First line in each cell (5-degree latitude–longitude block) indicates mean and standard deviation (where sample size is greater than two), second line indicates extremes, and third line indicates sample size (italicized, in parentheses).

Latitude (°N)	Longitude (°E)									
	70–75	**75–80**	**80–85**	**85–90**	**90–95**	**95–100**	**100–105**	**105–110**	**110–115**	**115–120**
					Both sexes: 44 ± 8.9, 20–72, (*120*)					
30–35	46 ± 3.8 41–50 (*5*)	44 ± 11.2 32–62 (*5*)					33 (*1*)	37 (*1*)		
25–30		49 ± 4.2 43–53 (*7*)		47 ± 5.9 38–56 (*8*)	43 ± 2.6 41–46 (*3*)	47 ± 8.3 34–58 (*15*)	49 45–53 (*2*)	36 ± 4.4 32–41 (*3*)		30 28–32 (*2*)
20–25		44 42–46 (*2*)		50 (*1*)	48 ± 7.7 36–57 (*9*)	41 ± 3.8 36–47 (*11*)	40 ± 6.6 33–55 (*9*)	36 ± 6.7 20–43 (*13*)	32 28–36 (*2*)	
15–20		44 (*1*)				55 ± 5.1 48–60 (*8*)	54 ± 4.7 50–61 (*5*)	37 ± 6.3 28–44 (*5*)		
10–15								68 64–72 (*2*)		

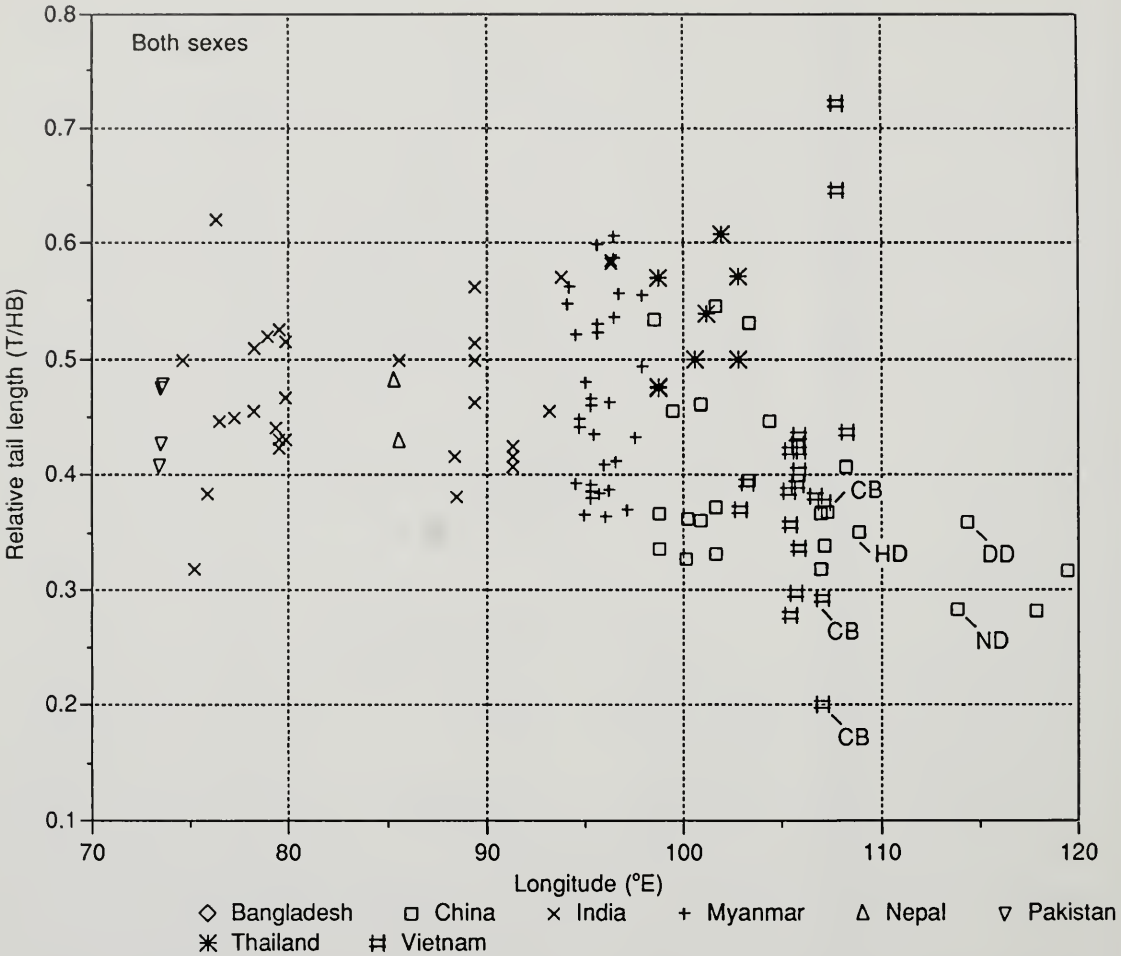

FIG. 12. Longitudinal variation in relative tail length (tail length/head and body length) in *Macaca mulatta* adult noncaptives. For detailed comments, see Figure 11.

Cranial Characters

Sex and Age Variation

In wild-collected adult specimens of *M. mulatta* (Figs. 14, 15, Table 8), greatest length of skull (excluding incisors) in 80 males (121.8 ± 8.3 mm) averages about 13% greater than in 120 females (107.8 ± 7.1), and rostral-postrostral ratio in 69 males (50.5 ± 3.0%) averages about 15% greater than in 111 females (44.1 ± 3.7%) (cf. Cochard, 1985, p. 237; Cheverud & Richtsmeier, 1986, p. 392; Mouri, 1995, p. 189). Relative zygomatic breadth (ZB/GL) in 79 males (70.7 ± 2.6%) averages only 2% greater than in 118 females (69.0 ± 2.2%).

From infancy to adulthood, rostral length increases much faster than postrostral length, whereas zygomatic breadth increases only slightly faster than greatest skull length (Table 8). In males, rostral-postrostral ratio in adults is more than 100% greater than in infants (cf. Bhatia, 1978, p. 66), and relative zygomatic breadth in adults is about 10% greater than in infants. Fluctuating asymmetry of the skull and teeth in *M. mulatta* tends to increase ontogenetically to age 6 years (Halgrímsson, 1999, p. 139). An intensive study of maxillomandibular growth in captive *M. mulatta* has been published by Schneiderman (1993, p. 75), and craniofacial growth in laboratory-colony captives has been compared with that in free-ranging captives by King and Schneiderman (1991, p. 105).

Dental emergence norms have been carefully studied in the Yale University laboratory colony

TABLE 6. Dry-skin measurements of 14 *Macaca mulatta* specimens collected at Xinglong Xian (= Eastern Tombs), Hebei Province, northeastern China.

Museum	No.	Sex	Age	Head and body length (mm)	Tail length (mm)	Relative tail length (T/HB; %)
AMNH	57038	M	Infant	280	95	33.9
	57039	M	Adult	>390	135	<34.6
	57040	M	Juvenile	385	140	36.4
	57042	F	Juvenile	440	160	36.4
	57043	?	Infant	380	130	34.2
	57108	?	Infant	300	135	45.0
	57110	?	Infant	300	110	36.7
BM(NH)	1931.1.7.2[1]	M	Adult	730	140	19.2
FMNH	39376	M	Juvenile	420	130	31.0
	39377	?	Juvenile	360	160	44.4
	39378	?	Juvenile	290	120	41.4
MNHN	335[2]	F	Juvenile	545	125	22.9
USNM	240704	F	Subadult	420	140	33.3
	240705	F	Juvenile	280	140	50.0

[1] Captive.
[2] Cf. Milne-Edwards, [1872], p. 228.

of *M. mulatta* (Fig. 16); in this study, emergence was defined as initial penetration of the gingiva by each tooth. In the Yale colony, deciduous teeth apparently emerged in four major waves. Teeth in the first wave (i_1, i^1, i_2) emerged at median age ca. 0.05 year (18 days), those in the second wave (i^2) at age ca. 0.1 year (36 days), those in the third wave (c_1, c^1, m_1, m^1) at age ca. 0.2 year (73 days), and those in the fourth wave (m_2, m^2) at age ca. 0.4 year (156 days). Following a diapause of approximately 1 year, permanent teeth also apparently emerged in four major waves. Teeth in the first wave of permanent teeth (M_1, M^1) emerged at median age ca. 1.4 years, those in the second wave (I_1, I^1, I_2, I^2) at age ca. 2.5 years, those in the third wave (M_2, M^2, P_3, P^3, C_1, C^1, P_4, P^4) at age ca. 3.5 years, and those in the fourth wave (M_3, M^3) at age ca. 5.7 years. Mandibular teeth, particularly those in the permanent set, usually emerged slightly earlier than their maxillary counterparts. Ages of dental emergence in females were generally similar to those in males, except for C_1 and C^1, which emerged ca. 0.6 year earlier in females (3.13 years, 3.46 years) than in males (3.84 years, 4.04 years), and M_3 and M^3, which emerged ca. 0.6 year earlier in males (5.30 years, 5.40 years) than in females (5.74 years, 6.23 years). The elapsed time between initial emergence of a tooth and its complete eruption to full height apparently is a few months for most teeth but probably is ca. 2 years for the permanent canines of males (Cheverud, 1981, pp. 158, 163). In the free-ranging colony of *M. mulatta* introduced in Cayo Santiago, the second and third molars reportedly emerged as much as 1 year later than in some laboratory colonies (Turnquist & Kessler, 1990, p. 309); this suggests that dental emergence in natural populations of *M. mulatta* may also be retarded relative to that in laboratory colonies.

Geographic Variation

SKULL LENGTH—Greatest length of skull provides the most comprehensive and reliable indication of geographic size variation in *M. mulatta* (Table 9). This measurement is available for 170 well-localized adult specimens—104 females and 66 males—collected at 126 localities.

Greatest length of skull in both sexes generally increases with increasing latitude (Fig. 17, Table 9). South of 20°N, mean greatest length is 101.1 ± 3.32 mm in 18 adult females and 113.7 ± 3.50 mm in 10 adult males; north of 30°N, mean greatest length is 119.0 ± 4.42 mm in nine adult females and 131.2 ± 6.02 mm in 12 adult males (cf. Albrecht, 1978, p. 129; Gelvin & Albrecht, 1996, p. 111). In 13 adult specimens collected on five islands in the South China Sea, greatest length is similar to that in continental specimens collected at the same latitude (Fig. 17). In the single adult skull (AMNH 57039, male) available from northeastern China, at the northeastern limit of the specific range, greatest length is surprisingly small

TABLE 7. Geographic variation in body weight (kg) in adult *Macaca mulatta*. First line in each cell (5-degree latitude–longitude block) indicates mean and standard deviation (where sample size is greater than two), second line indicates extremes, and third line indicates sample size (italicized, in parentheses).

Latitude (°N)	Longitude (°E)									
	70–75	**75–80**	**80–85**	**85–90**	**90–95**	**95–100**	**100–105**	**105–110**	**110–115**	**115–120**
					Adult females: 5.3 ± 1.3 kg, 3.0–10.0 kg, (*33*)					
30–35	7.0 (*1*)	10.0 (*1*)					8.2 (*1*)	6.0 5.5–6.5 (*2*)		
25–30		6.2 5.9–6.6 (*2*)		5.2 (*1*)	4.2 (*1*)	5.4 ± 1.4 4.3–7.0 (*3*)		5.0 (*1*)		
20–25				4.5 (*1*)	4.8 ± 0.3 4.5–5.0 (*3*)	5.1 ± 0.6 4.3–5.9 (*5*)	4.3 ± 1.0 3.6–5.5 (*3*)	5.3 ± 0.5 4.8–5.8 (*3*)	5.0 (*1*)	
15–20						3.8 3.0–4.5 (*2*)		4.8 4.7–4.8 (*2*)		
					Adult males: 7.7 ± 2.3 kg, 4.0–14.1 kg, (*25*)					
30–35	14.1 (*1*)	10.9 (*1*)								
25–30		9.0 ± 1.5 7.5–10.4 (*4*)		8.7 (*1*)	7.6 7.5–7.7 (*2*)					8.5 5.0–12.0 (*2*)
20–25					6.5 6.1–6.8 (*2*)	6.8 (*1*)	6.1 ± 1.1 5.1–7.4 (*4*)	7.3 ± 1.2 6.0–8.5 (*3*)	6.4 (*1*)	
15–20						6.2 (*1*)		6.1 4.0–8.2 (*2*)		

Note: Weight is not controlled for seasonal variation (see Table 2, footnote 3).

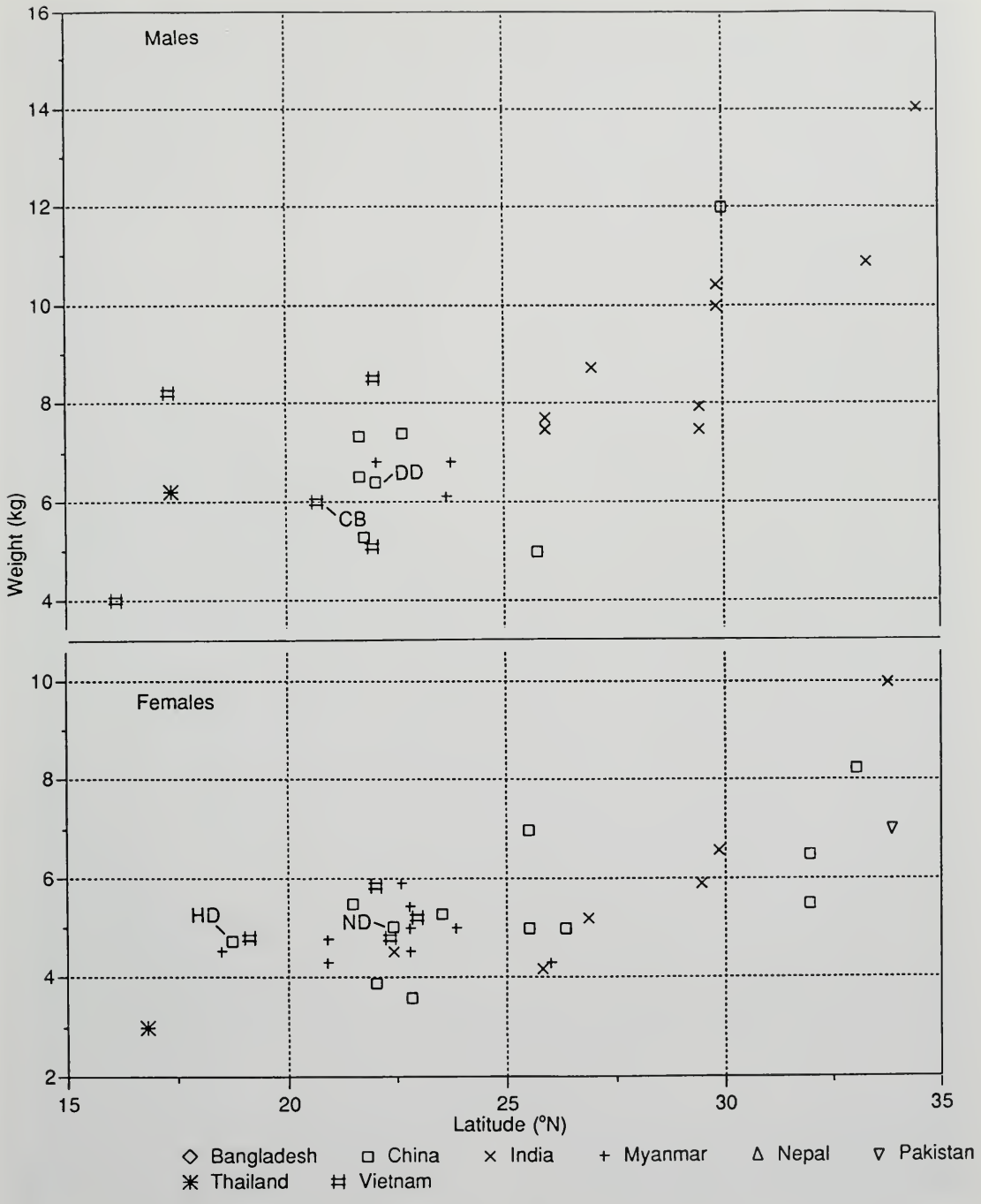

FIG. 13. Latitudinal variation in body weight in *Macaca mulatta* adult noncaptives; data points for insular specimens are indicated by two-letter abbreviations (CB = Cat Ba; DD = Dangan Dao; HD = Hainan Dao; ND = Neilingding Dao). Weight data are not available for Bangladeshi and Nepalese adults.

FIG. 14. Skull of adult female *Macaca mulatta*—FMNH 99668, Thailand: Ban Mae Lamao. (Photographs by John Weinstein, the Field Museum, negative Nos. Z 94270.1–4.)

(123.8 mm), considering the latitude (40°24′N) of collection of this specimen (Fig. 17); in a subadult female (USNM 240704) collected in the same area, greatest length also is small (100.6 mm).

Longitudinal variation in greatest length of skull is relatively minor (Fig. 18). For example, mean greatest length in a sample of adults collected between 30°N and 35°N in Pakistan and India (females, 120.9 ± 3.26 mm, n = 5; males, 129.3 ± 3.23 mm, n = 8) is similar to that in a sample collected 2,500 km to the east, across the Xizang-Qinghai (Tibetan) Plateau, at the same latitude in China (females, 116.7 ± 4.98 mm, n = 4; males, 136.8 mm [132.6–141.0 mm], n = 2).

CRANIAL AND DENTAL MORPHOLOGY—Variation in suites of cranial and dental measurements in >150 specimens that were collected in various sample areas in China and in six specimens that originated in India (localities unspecified) has been studied by two groups of Chinese investi-

FIG. 15. Skull of adult male *Macaca mulatta*—FMNH 99669, Thailand: Huai Ap Nang. (Photographs by John Weinstein, the Field Museum, negative Nos. Z 94271.1–4.)

TABLE 8. Cranial measurements and proportions in age/sex classes of wild-collected *Macaca mulatta*.

Age/sex class[1]	Greatest length (mm)	Relative zygomatic breadth (ZB/GL × 100)	Postrostral length (mm)	Rostral–postrostral ratio (R/PR × 100)
Infants	78.6 ± 6.8	64.3 ± 2.6	67.3 ± 4.6	24.2 ± 3.1
	65.8–93.6	59.1–69.9	59.7–79.2	19.8–34.3
	(*37*)	(*37*)	(*33*)	(*33*)
Juveniles	97.8 ± 10.0	67.3 ± 2.2	76.4 ± 5.4	36.1 ± 6.0
	79.1–126.7	61.8–73.5	60.9–91.5	26.8–53.6
	(*148*)	(*146*)	(*133*)	(*132*)
Subadult females	101.0 ± 4.3	68.1 ± 1.8	77.8 ± 3.0	39.6 ± 2.8
	95.0–112.0	64.7–71.6	72.1–85.0	34.6–46.8
	(*20*)	(*20*)	(*19*)	(*19*)
Subadult males	118.4 ± 7.5	68.9 ± 2.6	85.8 ± 4.7	49.7 ± 3.0
	105.9–136.8	64.1–73.7	78.8–96.3	43.6–56.4
	(*36*)	(*36*)	(*33*)	(*32*)
Adult females	107.8 ± 7.1	69.0 ± 2.2	80.7 ± 4.5	44.1 ± 3.7
	92.9–126.5	60.1–73.9	71.3–92.6	37.6–59.4
	(*120*)	(*118*)	(*111*)	(*111*)
Adult males	121.8 ± 8.3	70.7 ± 2.6	86.4 ± 4.2	50.5 ± 3.0
	107.1–143.1	65.0–76.1	77.8–96.9	41.3–58.2
	(*80*)	(*78*)	(*69*)	(*69*)

Note: Mean ± SD, extremes, and sample size (italicized figures in parentheses). For definition of cranial measurements, see Fooden (1969, p. 40).

[1] Dental specifications: infants, deciduous teeth only; juveniles, some permanent teeth erupted; subadults, third molars in females or canines in males incompletely erupted; adults, all permanent teeth completely erupted.

gators (Jiang Xuelong et al., 1991, p. 242; 1995, p. 44; Pan et al., 1992, p. 40; Peng et al., 1993, p. 2; Yao et al., 1995, p. 113; Yu et al., 1996, p. 152; cf. Sikorska-Piwowska, 1970, p. 9). Although distributions of cranial and dental measurements overlap in these samples, statistically significant differences were discovered among the Chinese samples and between the Chinese and the Indian samples. The two groups of investigators disagree concerning the morphological relationships of samples of *M. mulatta* collected in south-central China; one group found its south-central Chinese sample to be most similar to a southeastern Chinese sample (Jiang Xuelong et al., 1995, p. 46), whereas the other group found its south-central Chinese sample to be most similar to a southwestern Chinese sample (Yu et al., 1996, p. 153).

Mandibular measurements in specimens of *M. mulatta* collected in three regions of China have been analyzed by Zhao et al. (1999, p. 63).

Comparison with *Macaca fascicularis*

Skull length in both sexes averages greater in *M. mulatta* than in its southern relative, *M. fascicularis* (cf. Fooden, 1995, p. 38). Conversely, the rostrum in *M. mulatta* protrudes less than in *M. fascicularis* (cf. Mouri, 1996, p. 296; Pan et al., 1998, p. 525). Width of the braincase and rostrum appear to be greater in *M. mulatta* than in *M. fascicularis*. A median sagittal crest, formed by ontogenetic convergence of the temporal lines, is rare in *M. mulatta* adult males (well-defined crest in three of 71 specimens examined, incipient crest in one specimen), whereas a sagittal crest is common in *M. fascicularis* adult males.

Molecular Biology and Genetics

Mitochondrial DNA

Data concerning the geographic variation in mitochondrial DNA (mtDNA) in *M. mulatta* have been published by three research groups: Hayasaka et al. (1988, p. 271; 1996, p. 1044), Melnick et al. (1993, p. 284; cf. Morales & Melnick, 1998, p. 7), and Zhang and Shi (1989, p. 334; 1993a, p. 8; 1993b, p. 591). In addition, Disotell et al. (1992, p. 6) have published the nucleotide se-

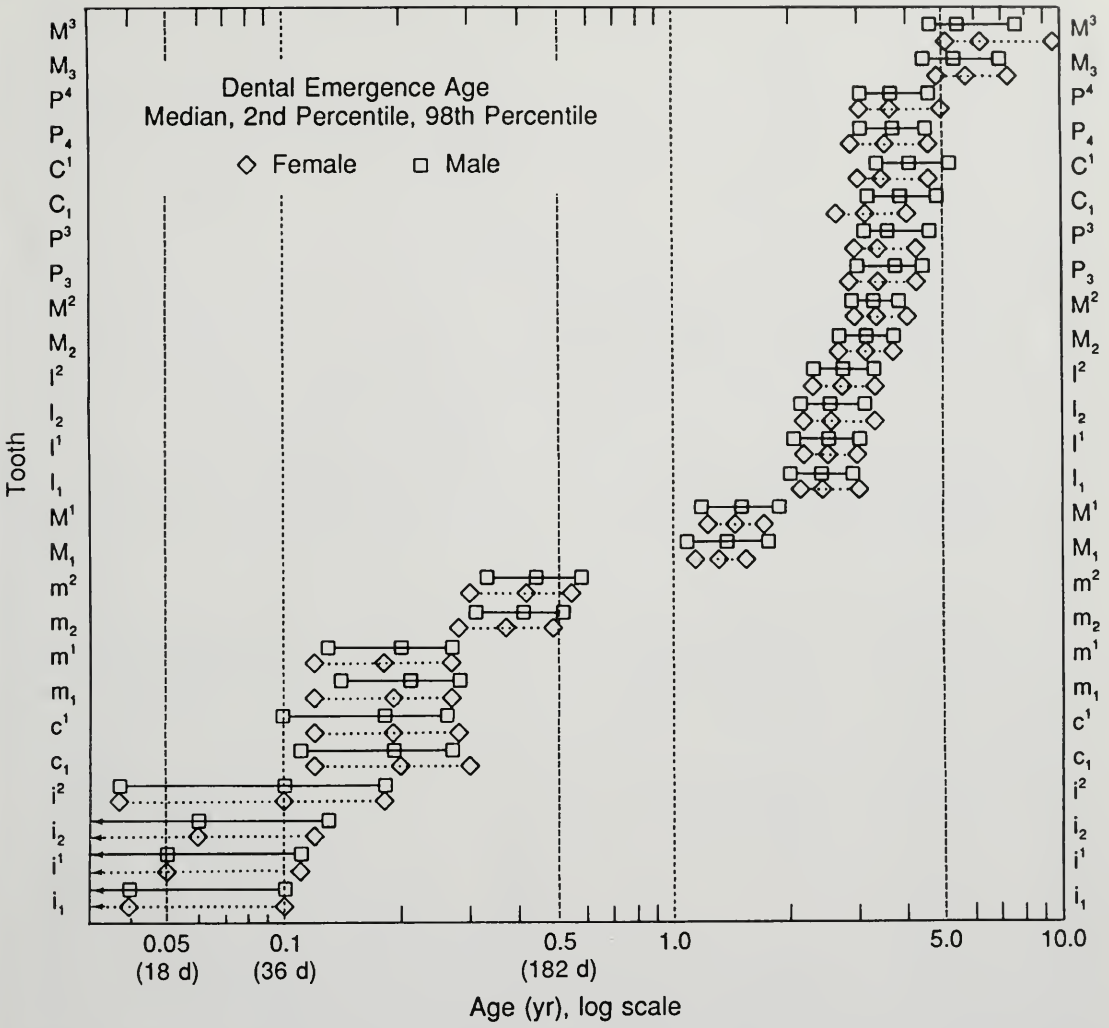

FIG. 16. Dental emergence chronology in *Macaca mulatta*, laboratory colony sample (Hurme & van Wagenen, 1953, pp. 297, 299; 1961, pp. 111-112, 128; Hurme, 1960, pp. 796–797; cf. Maity & Rathore, 1998, p. 250); median, 2nd percentile, and 98th percentile values are indicated for age at initial penetration of gingiva by deciduous and permanent teeth in females and males. Abbreviations: i/I = incisor, c/C = canine, P = premolar, m/M = molar; lowercase letters indicate deciduous teeth, uppercase letters indicate permanent teeth; subscripts indicate mandibular teeth, superscripts indicate maxillary teeth. Arrowheads (lower left in graph) indicate six off-scale 2nd percentile values: i_1, females and males, 0 years (i.e., tooth already erupted at birth); i^1 and i_2, males, 0 years; i^1 and i_2, females, 0.0082 years. Sample sizes: i_1, i^1, i_2, i^2—females (n = 53), males (44); c_1, c^1—females (51), males (41–42); m_1, m^1—females (50), males, (41); m_2, m^2—females (43–44), males (32–33); M_1, M^1—females (42), males (30); I_1, I^1, I_2, I^2—females (41–42), males (22–25); M_2, M^2—females (39–40), males (18–19); P_3, P^3, C_1, C^1, P_4, P^4—females (35–39), males (13–17); M_3, M^3—females (30–31), males (10–12). For additional dental emergence age data collected by various procedures, see Schultz, 1935, p. 499; Eckstein, 1949, p. 367; Gavan, 1967, p. 985; McNamara et al., 1977, p. 701; Trotter et al., 1977, p. 111; Cheverud, 1981, p. 163; Zeng et al., 1984, p. 83; Sharma & Lal, 1986, p. 145; Turnquist & Kessler, 1990a, p. 309; 1990b, p. 239; Zeng, 1992, pp. 20, 22; Smith et al., 1994, pp. 215, 226.

quence of the mitochondrial COII gene in one *M. mulatta* individual from an unspecified locality.

Hayasaka et al. (1988, p. 271) used 17 endonucleases to study mtDNA restriction sites in one *M. mulatta* specimen of Indian origin (no further locality information available) and subsequently (1996, p. 1046) determined the nucleotide sequence of an 896-bp region of mtDNA in this

TABLE 9. Geographic variation in greatest length of skull (mm) in adult *Macaca mulatta*. First line in each cell (5-degree latitude–longitude block) indicates mean and standard deviation (where sample size is greater than two), second line indicates extremes, and third line indicates sample size (italicized, in parentheses).

Latitude (°N)	Longitude (°E)									
	70–75	**75–80**	**80–85**	**85–90**	**90–95**	**95–100**	**100–105**	**105–110**	**110–115**	**115–120**
	Adult females: 108 ± 7.0, 93–126, (*104*)[1]									
30–35	120 ± 0.9 119–121 (*3*)	122 118–126 (*2*)					120 119–120 (*2*)	114 109–118 (*2*)		
25–30		109 ± 3.5 104–112 (*5*)		104 ± 3.0 99–106 (*5*)	107 ± 1.0 106–108 (*4*)	106 ± 5.2 100–125 (*19*)[2]	120 ± 3.4 117–125 (*5*)	110 (*1*)		116 ± 1.8 115–118 (*3*)
20–25	104 103–104 (*2*)			104 ± 4.9 99–109 (*3*)	108 ± 3.6 106–113 (*4*)	102 ± 4.2 96–107 (*8*)	106 ± 5.7 98–111 (*4*)	110 ± 4.5 104–117 (*13*)	101 (*1*)	
15–20						99 ± 3.4 93–102 (*6*)	102 (*1*)	102 ± 3.3 97–108 (*9*)		
10–15								105 104–105 (*2*)		
	Adult males: 121 ± 8.0, 107–143, (*66*)[3]									
40–45										124 (*1*)
35–40	143 (*1*)									
30–35	129 ± 2.0 127–131 (*3*)	129 ± 4.0 124–135 (*5*)					137 133–141 (*2*)			
25–30		124 ± 4.9 117–129 (*5*)		117 ± 3.6 113–123 (*7*)	120 (*1*)	121 ± 9.5 109–134 (*5*)[4]				131 129–132 (*2*)
20–25			128 (*1*)	122 111–132 (*2*)[5]	115 ± 5.5 107–122 (*6*)	113 109–118 (*2*)	118 ± 3.6 113–122 (*6*)	120 ± 5.0 112–125 (*6*)	116 (*1*)	
15–20						116 ± 1.5 115–118 (*3*)	109 ± 2.6 107–112 (*3*)	115 ± 1.6 113–116 (*4*)		

[1] Excludes 16 imprecisely localized specimens that are included in Table 8.
[2] Includes one aberrantly large skull (GL = 124.8 mm) purchased at Zayu Xian, Xizang Province, China. Excluding this skull, this entry would be 105 ± 2.9, 100–111, (*18*).
[3] Excludes 14 imprecisely localized specimens that are included in Table 8.
[4] Includes one aberrantly large skull (GL = 134.0 mm) purchased at Zayu Xian, Xizang Province, China. Excluding this skull, this entry would be 117 ± 6.8, 109–124, (*4*).
[5] Includes one aberrantly large skull (GL = 131.8 mm) collected at Calcutta, West Bengal State, India.

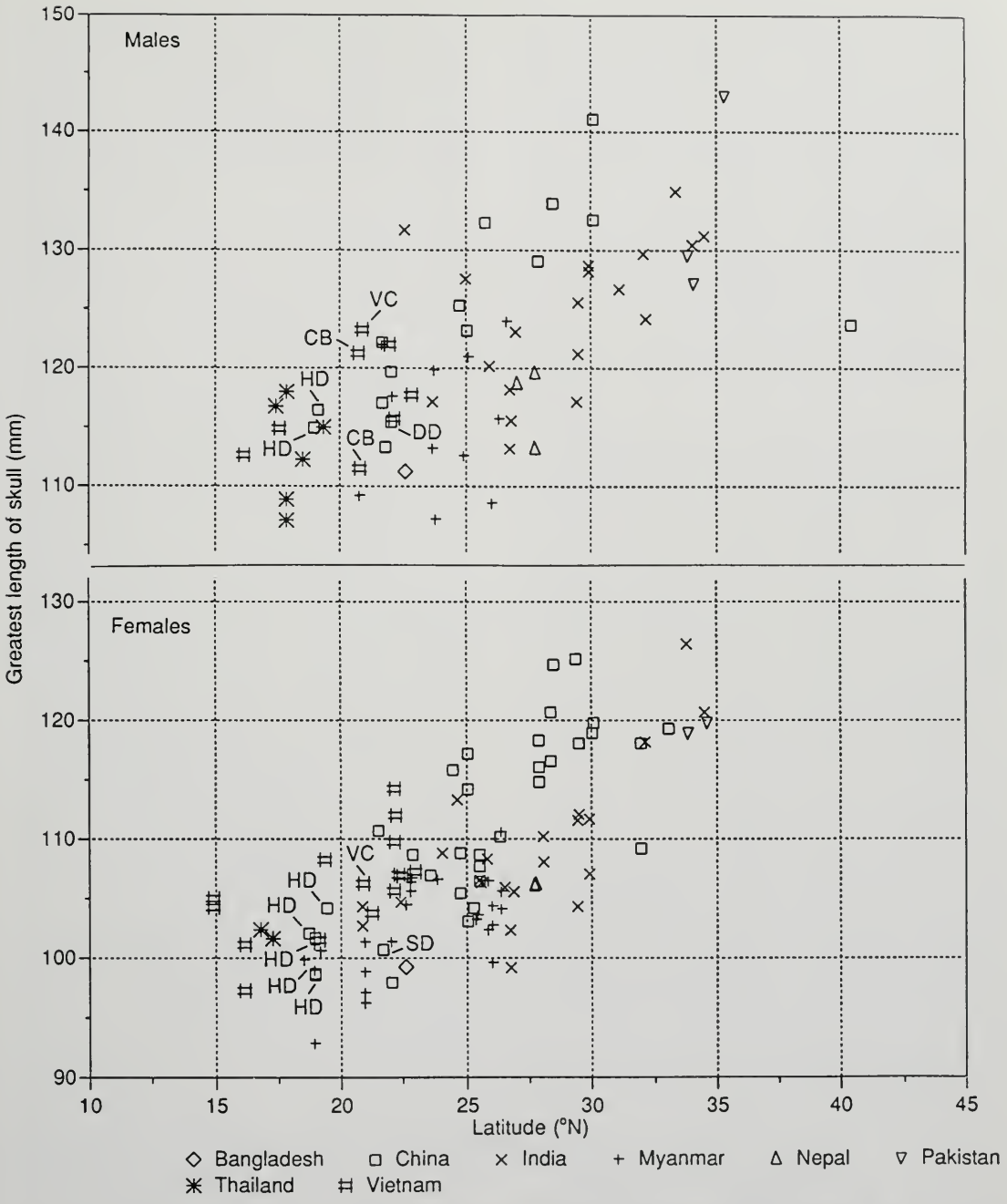

FIG. 17. Latitudinal variation in greatest length of skull in *Macaca mulatta* adult noncaptives. Data points for insular specimens are indicated by two-letter abbreviations (CB = Cat Ba; DD = Dangan Dao; HD = Hainan Dao; SD = Shangchuan Dao; VC = Van Canh).

Indian specimen and in two *M. mulatta* specimens of unknown country of origin; the mtDNA data of these three *M. mulatta* specimens were compared with data derived from *M. cyclopis* (Taiwan; n = 1), *M. fuscata* (Japan; n = 3), and other macaque species. Although the nucleotide sequences of the two *M. mulatta* specimens of unknown country of origin differ from each other at only

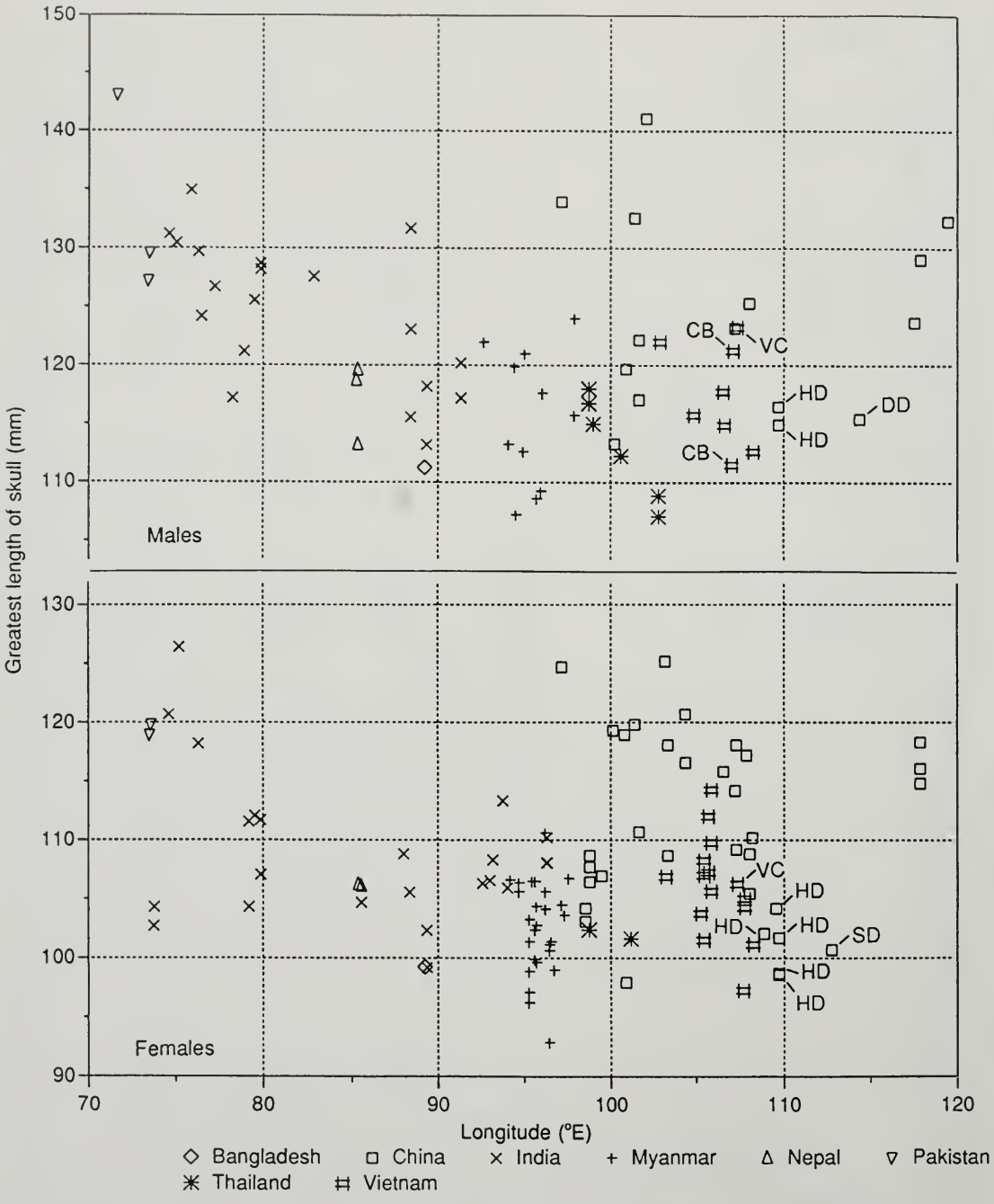

FIG. 18. Longitudinal variation in greatest length of skull in *Macaca mulatta* adult noncaptives. For key to abbreviations, see Figure 17.

0.2% of the sites, their sequences differ from that of the Indian specimen at ca. 6.2% of the sites; this intraspecific sequence divergence greatly exceeds the interspecific divergence between the Indian *M. mulatta* specimen and *M. cyclopis* (3.2%) and between the Indian *M. mulatta* specimen and *M. fuscata* (ca. 3.6%). Sequence divergence between the two *M. mulatta* specimens of unknown

country of origin and *M. cyclopis* and *M. fuscata* is ca. 5.1% and 5.8%, respectively. Hayasaka et al. (1996, p. 1052) suggest that the taxonomically incongruous intraspecific and interspecific divergences in their *M. mulatta*, *M. cyclopis*, and *M. fuscata* sequence data may be the result of either retention of ancestral polymorphism or interspecific hybridization.

Melnick et al. (1993, p. 284) used 15 endonucleases to study mtDNA restriction sites in 18 individuals representing five *M. mulatta* populations—one each from Pakistan (n = 3), northern India (n = 4), and Myanmar (n = 4) and two from southern China (n = 5, n = 2); the exact provenance of these five samples and the number of localities represented by each are unspecified (cf. Melnick et al., 1984, p. 342; Morin et al., 1997, p. 201). Of the 10 haplotypes that were identified in this study, one is unique to the smaller Chinese sample, and three sets of three haplotypes each are unique to the Indian, Myanmar, and larger Chinese samples, respectively; the single haplotype common to the three individuals in the Pakistani sample is the same as that of one individual in the Indian sample. Distance-based and character-based trees reveal similar patterns of relationships among the *M. mulatta* samples studied. In both kinds of trees, the primary divergence is between the Pakistani/Indian (western) samples and the Myanmar/Chinese (eastern) samples (divergence = 3.9% ± 0.45%); on the basis of the magnitude of this divergence, Melnick et al. (1993, p. 287) suggest that western and eastern populations of *M. mulatta* formerly were separated by a major barrier. Divergences among the seven individuals in the Pakistani/Indian samples are very small (d = 0.4% ± 0.31%). The divergence between the Myanmar sample and the two Chinese samples (d = 2.3% ± 0.58%) is approximately twice as great as that between the two Chinese samples (d = 1.2% ± 0.15%).

As a supplement to their investigation, Melnick et al. (1993, pp. 283, 286) compared their data with Hayasaka et al.'s (1988, p. 271) data for one Indian specimen of *M. mulatta*, one specimen of *M. cyclopis*, and three specimens of *M. fuscata* (see above). The haplotype of Hayasaka et al.'s Indian *M. mulatta* specimen is most divergent from haplotypes of Melnick et al.'s Chinese samples (d = 3.3% ± 0.16%), next most divergent from the Pakistani/Indian samples (d = 3.0% ± 0.25%), and least divergent from the Myanmar sample (d = 2.1% ± 0.12%); this suggests that Hayasaka et al.'s Indian *M. mulatta* specimen may have originated in eastern India, nearer to Myanmar than to Pakistan. Distance- and character-based trees indicate that haplotype similarity among eastern *M. mulatta*, *M. cyclopis*, and *M. fuscata* is greater than haplotype similarity between eastern and western *M. mulatta*; this discrepancy between the gene tree revealed by mtDNA and the species tree revealed by morphology and allozymes (see "Blood Proteins," p. 52) parallels the taxonomically incongruous findings reported by Hayasaka et al. (see above). Melnick et al. (1993, p. 290; cf. Hoelzer, 1997, p. 624) interpret the pattern of mtDNA haplotype relationships as a retention of ancestral mtDNA similarity by eastern *M. mulatta*, *M. cyclopis*, and *M. fuscata*.

In a geographically detailed study, Zhang and Shi (1993b, p. 591) used 20 endonucleases to study mtDNA haplotypes in 36 *M. mulatta* individuals collected at 23 localities in China, Myanmar, and Vietnam (Fig. 19); their analysis also includes Hayasaka et al.'s haplotype data for the Indian *M. mulatta* specimen cited above. Restriction fragment length analysis revealed that each of the 24 localities sampled by Zhang and Shi is characterized by a distinctive mtDNA haplotype; at each of the nine localities represented by more than one individual, haplotypes were uniform in all individuals sampled (n = 2–4). Two trees—one based on the unweighted pair group (UPG) method and the other based on the neighbor-joining (NJ) method (cf. Melnick et al., 1992, p. 196)—were constructed by Zhang and Shi to investigate the pattern of resemblance among the 24 local haplotypes. Although Zhang and Shi favored the UPG tree because of its general congruence with one of several previously proposed subspecific classifications of *M. mulatta* (Jiang Xuelong et al., 1991, p. 242; cf. 1995, p. 44), a consensus tree of stable clusters common to both the UPG tree and the NJ tree provides an independent estimate of geographic variation in mtDNA haplotypes that is not biased by taxonomic preconceptions (Fig. 20).

As indicated by the consensus tree, the largest mtDNA haplotype divergence is between Zhang and Shi's insular Hainan *M. mulatta* sample (*20*, n = 2) and 20 mainland locality samples (d = 3.5% ± 0.49%); the positions of three mainland locality samples (E Guangxi, *6*; Henan, *12*; Fujian, *15*) are unresolved relative to this dichotomy. The second-largest mtDNA haplotype divergence is between Hayasaka et al.'s Indian sample (*24*, n = 1) and the remaining 19 locality samples (d =

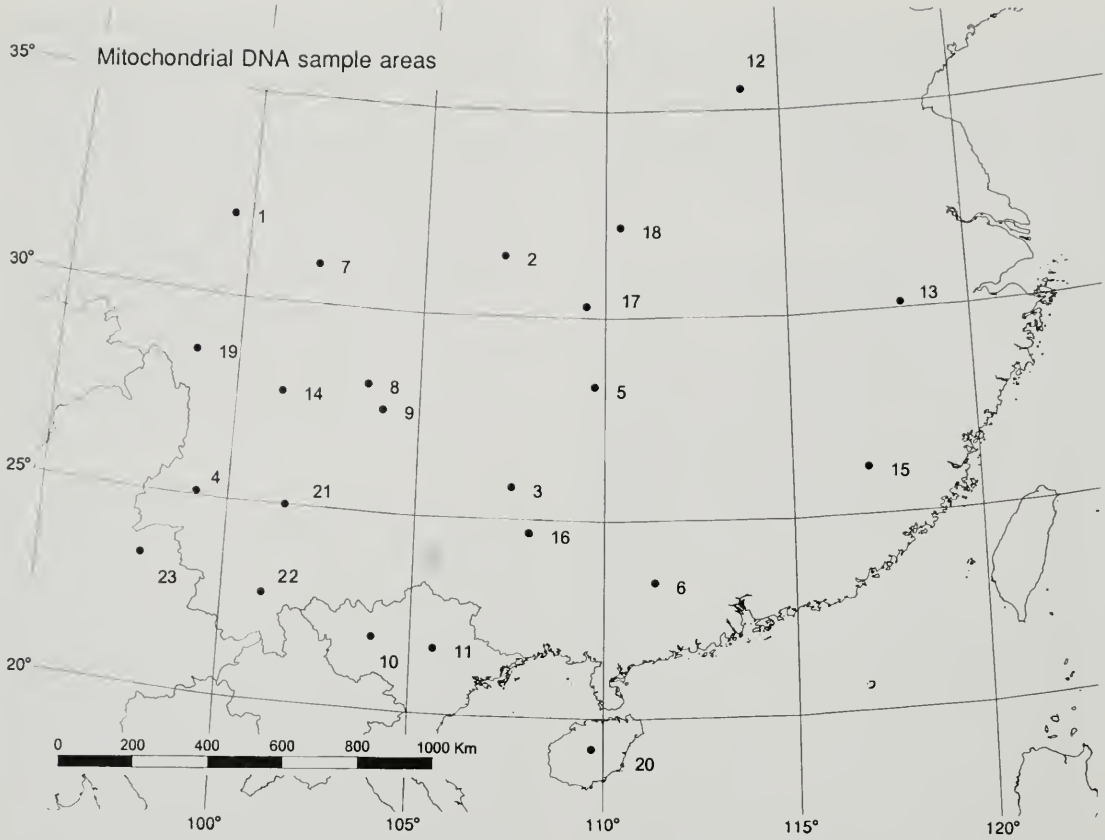

FIG. 19. Sample areas cited in mitochondrial DNA study of Zhang and Shi (1993b, p. 590); sample area no. 24 ("India") is not mapped. For key to sample area numbers, see Figure 20.

2.8% ± 0.35%). The third-largest divergence is between the northwestern Sichuan sample (*1*, n = 3) and 17 locality samples from Myanmar, China, and Vietnam (d = 1.6% ± 0.29%); the position of one Chinese locality sample (northwestern Yunnan, *19*) is unresolved relative to this dichotomy. The fourth-largest divergence is between the eastern Myanmar sample (*23*, n = 2) and the remaining 16 locality samples (d = 1.3% ± 0.23%). Although the branching pattern of the residual 16 locality samples is not completely resolved, 15 of these samples are positioned within three stable clusters (Fig. 18) as follows:

1. Southwestern Yunnan (*22*, n = 2); west-central Yunnan (*4*, n = 1); southeastern Hubei (*17*, n = 1). Within this cluster, the close resemblance between the west-central Yunnan sample and the southeastern Hubei sample is particularly noteworthy; although these two localities are separated by ca. 1,100 km, the haplotype divergence between the samples is only 0.17%.

2. Central Yunnan (*21*, n = 1); northeastern Yunnan: Yongshan (*8*, n = 1); northeastern Yunnan: Yillang (*9*, n = 1); southern Sichuan (*14*, n = 2); Hunan (*5*, n = 1). This and the preceding cluster overlap geographically (Fig. 17).

3. West-central Sichuan (*7*, n = 1); eastern Sichuan (*2*, n = 2); Anhui (*13*, n = 1); Guizhou (*3*, n = 3); northern Guangxi (*16*, n = 1); northern Vietnam (*10*, n = 1); northern Vietnam (*11*, n = 1).

On the basis of available information (see above), the following hypotheses may be proposed concerning geographic variation in mtDNA in *M. mulatta*:

1. Haplotypes usually are uniform in each local population of *M. mulatta*.

2. Haplotypes in each local population of *M. mulatta* usually differ from those in other local populations.

3. Intraspecific haplotype variation may exceed interspecific haplotype variation.

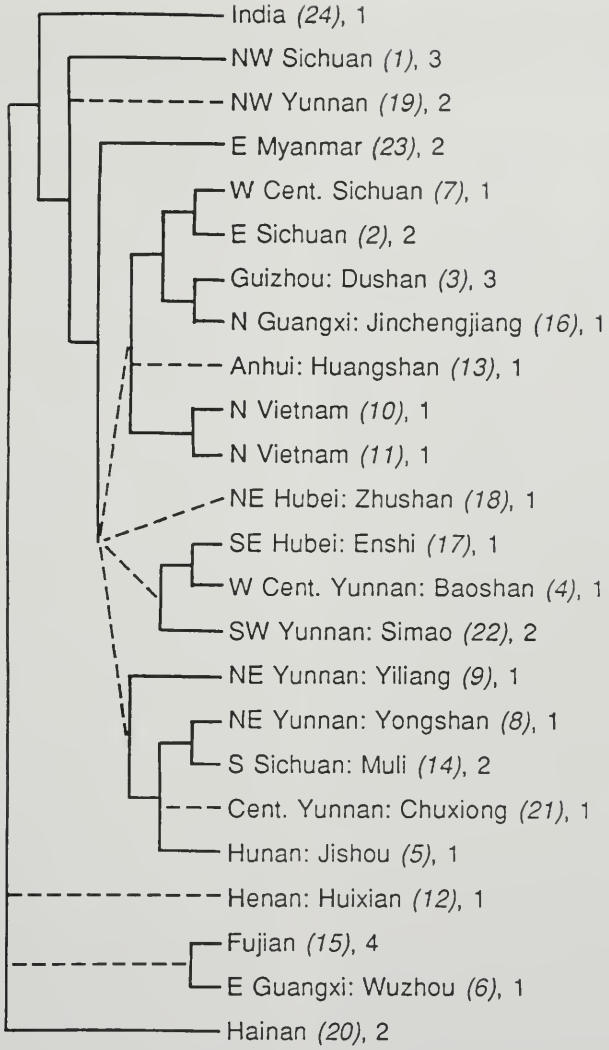

FIG. 20. Consensus dendrogram of mitochondrial DNA relationships in *Macaca mulatta* samples studied by Zhang and Shi (1993b, p. 597). In each line, the italicized number in parentheses is the sample area number (see Fig. 19), and the number following the comma is the sample size.

4. Haplotypes in eastern populations of *M. mulatta* (Myanmar, China, Vietnam) are more divergent from those in western populations of *M. mulatta* (Pakistan, northern India) than they are from those in *M. cyclopis* (Taiwan) and *M. fuscata* (Japan). To determine whether haplotype variation between eastern and western populations of *M. mulatta* is gradual or abrupt, data from geographically intermediate populations would be required.

5. The known haplotype in the insular Hainan population of *M. mulatta* diverges strongly from haplotypes in eastern mainland populations of *M. mulatta*.

6. The known haplotype in the northwestern Sichuan population of *M. mulatta* diverges strongly from haplotypes in other mainland Chinese populations, Vietnamese populations, and eastern Myanmar populations.

7. Haplotypes in Myanmar populations of *M. mulatta* are divergent from those in Chinese and Vietnamese populations.

Authors cited above differ in their interpretation of the chronological significance of mtDNA haplotype variation. Hayasaka et al. (1996, p. 1052) and Zhang and Shi (1993b, p. 594) assume a constant rate of mtDNA nucleotide substitution

in *Macaca*, whereas Melnick et al. (1993, p. 290; cf. Melnick and Hoelzer, 1993, p. 6; Hoelzer et al., 1998, p. 29) present evidence that this rate may be variable.

Nuclear DNA

Using nine enzymes (*Alu*I, *Bam*HI, *Eco*RI, *Hin*dIII, *Hin*fI, *Hpa*I, *Pst*I, *Pvu*II, and *Xmn*I), Crovella et al. (1994, p. 66) studied highly repeated nuclear DNA restriction patterns in two *M. mulatta* captives. One captive, identified as *M. m. mulatta*, presumably originated in India, and the other, identified as *M. m. lasiotus*, presumably originated in China. The restriction patterns of these two captives were indistinguishable.

M. mulatta is polymorphic for the chemokine receptor CXCR4 (a coreceptor for human immunodeficiency virus), but this polymorphism is not known to vary geographically (Chen et al., 1997, p. 2707; Prétet et al., 1998, p. 639). Of 17 rhesus monkeys tested for CXCR4 alleles, allele 1 (adenine at nucleotide 641) was detected in two Indian samples, and allele 2 (thymidine at nucleotide 641) was detected in six Indian samples, seven Chinese samples, and two samples of unknown geographic origin.

Twenty *M. mulatta* captives—10 of Chinese origin and 10 of Indian origin—were included in two studies of restriction fragment length polymorphism at four loci in the β-globin gene cluster (Shimizu & Takenaka, 1991a, p. 178; 1991b, p. 191). Although *M. mulatta* is reported to be polymorphic at all four loci, no data are available concerning the possibility of a relationship between polymorphism and country of origin in this species.

Morin et al. (1997, p. 206; cf. Smith, 1994a, p. 205; Kanthaswamy & Smith, 1998, p. 141) report that mean gene diversity for 15 simple sequence repeat loci is greater in a Chinese *M. mulatta* sample (0.78) than in Indian (0.66) and Thai (0.61) *M. mulatta* samples. Watanabe et al. (1997, p. 351) have compared the nucleotide sequence at the HPRT locus in one *M. mulatta* specimen of unspecified geographic origin with that of other macaque species and nonmacaque catarrhines.

Blood Proteins

Judging from available information, geographic variation in blood-protein allele frequencies in *M. mulatta* is relatively minor (Table 10; F_{ST} = 0.0253); the most variable locus is Tf (transferrin). Melnick (1988, p. 207; cf. Su et al., 1997, p. 112) studied 25 to 37 loci in samples of this species from Pakistan, India, China, and Thailand; the geographic span of these samples exceeds 3,000 km. For the loci studied, Melnick estimates that the total blood-protein gene diversity in *M. mulatta* is 0.0814; he allocates ca. 86.5% of this diversity to individual differences among members of the same troop, ca. 3.8% to differences among neighboring troops, ca. 1.0% to differences among local populations within the same country, and ca. 8.7% to differences among populations in different countries. In another study, Melnick et al. (1986, p. 136) found that intercountry variation is weakly clinal. In this cline, the Pakistani and Indian samples form one cluster and the Chinese and Thai samples form another; when a Bangladeshi sample was included in the analysis, it clustered with the Pakistani and Indian samples. Smith et al. (1987, p. 204), in a brief summary comment, indicate that Indian and Chinese samples from unspecified localities approach fixation for opposite alleles at genetic loci for carbonic anhydrase II, properdin factor B, and albumin.

Ding et al. (1998, p. 172) studied blood-protein variation in *M. mulatta* samples collected at six localities in western Yunnan, China. Samples from three localities north of 25°30′N tended to differ from those from three localities south of 25°30′N. Within the northern and southern groups of samples, blood-protein divergence was not related to the distance between localities.

Schmitt and Tomiuk (1995, p. 126) have shown that the distribution of blood-protein allele frequencies per locus in *M. mulatta* closely approximates that predicted by the neutral mutation hypothesis. Three recent studies have investigated the use of blood-protein data in monitoring and maintaining genetic variability in captive research colonies of this species (Gill et al., 1992, p. 89; Smith, 1994a, p. 204; Ely et al., 1994, p. 212).

Karyology

Although chromosomal polymorphism has been reported in *M. mulatta* (Sharma & Seth, 1984, p. 380; Small et al., 1985, p. 66), no information is available concerning possible geographic variation in karyotype. The diploid chromosome number in this species is 42.

TABLE 10. Frequencies (%) of major alleles at polymorphic blood-protein loci in samples of *Macaca mulatta* from six countries (sample sizes indicated by italicized figures in parentheses). Because variability at the Tf locus is exceptionally large, frequency data are provided for six alleles at this locus. For key to locus abbreviations, additional frequency details, and references, see Fooden and Lanyon (1989, p. 214).

Locus	Allele	Pakistan	India	Bangladesh	China	Thailand	Vietnam
Acp	A	100 (*219*)	100 (*214*)	— (*0*)	98 (*76*)	100 (*31*)	— (*0*)
ADA	2	97 (*216*)	99 (*214*)	— (*0*)	92 (*76*)	94 (*31*)	— (*0*)
Alb	A	98 (*32*)	40 (*214*)	— (*0*)	98 (*76*)	95 (*31*)	— (*0*)
CA-I	A	100 (*219*)	100 (*238*)	100 (*26*)	96 (*76*)	85 (*46*)	— (*0*)
CA-II	B	71 (*186*)	— (*0*)	— (*0*)	— (*0*)	40 (*5*)	— (*0*)
Dia	C	67 (*32*)	77 (*214*)	— (*0*)	81 (*76*)	46 (*31*)	— (*0*)
IDH	2	100 (*219*)	99 (*214*)	— (*0*)	83 (*76*)	75 (*31*)	— (*0*)
PGD	A	99 (*219*)	84 (*238*)	84 (*25*)	97 (*76*)	99 (*46*)	— (*0*)
PGM-I	1	100 (*219*)	100 (*214*)	— (*0*)	97 (*76*)	96 (*31*)	— (*0*)
PGM-II	1	100 (*219*)	100 (*214*)	— (*0*)	97 (*76*)	100 (*31*)	— (*0*)
PHI	1	92 (*216*)	93 (*214*)	— (*0*)	96 (*76*)	96 (*31*)	— (*0*)
PI	C	100 (*32*)	100 (*314*)	94 (*25*)	100 (*76*)	99 (*46*)	— (*0*)
TBPA	F	83 (*32*)	88 (*342*)	88 (*39*)	80 (*76*)	83 (*44*)	— (*0*)
Tf	C	26 (*219*)	45 (*688*)	35 (*55*)	23 (*106*)	28 (*59*)	30 (*67*)
	D	7	22	12	20	7	13
	E	1	2	10	9	14	3
	F	14	4	9	9	19	15
	F′	0	3	0	3	0	13
	G	26	16	11	28	24	17
	Other	26	8	23	8	8	9

Physiology and Disease

Blood, Cerebrospinal Fluid, and Temperament

Champoux et al. (1994, p. 352; 1996, p. 81; 1997, p. 56) compared *M. mulatta* infants of Indian ancestry (n = 29) and *M. mulatta* infants of mixed Indian-Chinese ancestry (n = 13) with respect to hematology, serum biochemistry, cerebrospinal 5-HIAA values, and temperament; all infants were nursery reared, and no infants of pure Chinese ancestry were available for this study. The two groups of infants differed significantly ($P < 0.05$) in hematocrit, hemoglobin, mean corpuscular hemoglobin concentration, mean corpuscular hemoglobin, erythrocyte count, gamma-glutamyltransferase, phosphorus, and total protein. The authors were uncertain whether the same differences would be found in mother-reared infants, and they also were uncertain whether to attribute the hematological and serum biochemical differences to environmental adaptation or random genetic drift.

Compared with the purebred Indian infants, the Chinese-Indian hybrids exhibited lower orientation ability and higher irritability. In separation-reunion experiments, the Chinese-Indian hybrids tended to exhibit greater locomotor stereotypy, less vocalization, and less social play.

Lead Content of Molars

Głąb and Szostek (1996, p. 216) compared the lead content of the lower first molar in 16 *M. mulatta* immatures collected in western India with that in 29 immatures collected in Thailand. The mean lead content in the Indian sample (7.12 ± 2.18 μg/g) was nearly five times that in the Thai sample (1.51 ± 0.48 μg/g; $P < 0.001$). The authors indicate that the difference probably was the result of exposure to different levels of lead in the environment.

Malaria

The geographic range of *M. mulatta* is mainly north of the geographic range of the Leucosphyrus group of *Anopheles* mosquitoes, which is the group that includes all known natural vectors of macaque malaria (Fooden, 1994, p. 575). Reported natural malaria infections in *M. mulatta* are restricted to Bangladesh, Thailand, and Vietnam, all in the area where the range of *M. mulatta* over-

laps that of the Leucosphyrus group. In this area, the known incidence of natural infection is 9.3% (n = 290); contrastingly, in northern India, outside of this area, the incidence of infection is 0% (n > 24,000).

The two species of malarial parasites that are known to naturally infect *M. mulatta* are *Plasmodium cynomolgi* and *P. inui*, the most widely distributed of the seven species of *Plasmodium* that infect macaques (Fooden, 1994, p. 578). Natural and experimental infections with *P. cynomolgi* and *P. inui* are relatively benign in *M. mulatta*. However, experimental infections of *M. mulatta* with *P. knowlesi*, a macaque parasite that does not occur within the geographic range of *M. mulatta*, usually are fatal (n > 90). This suggests that *M. mulatta* has evolved partial resistance to the malarial parasites with which it is sympatric.

Viral Infections

In a field study, 24 *M. mulatta* individuals in Bangladesh and six *M. mulatta* individuals in Thailand were tested for antibodies to reveal infections with simian T-lymphotropic retrovirus, type 1 (Ishida et al., 1985, p. 841; Ishida & Varavudhi, 1992, p. 163). Of these 30 individuals, only one from Thailand was seropositive. In other species of macaques studied in Thailand, four of 367 *M. fascicularis* individuals and two of 137 *M. arctoides* individuals were seropositive for this virus; no species of macaque other than *M. mulatta* was tested in Bangladesh.

In a laboratory study, five *M. mulatta* individuals imported from India and six imported from China were compared with respect to susceptibility to experimental infection with simian immunodeficiency virus of macaques ($SIV_{mac}239$) (Joag et al., 1994, p. 439). Plasma virus titer, infectious cell frequency, and virus burden in spleen and lymph nodes all indicated that the rhesus monkeys imported from India were significantly less resistant to infection with $SIV_{mac}239$ than were those imported from China.

Natural History

Habitats

Judging from the geographic distribution of *M. mulatta*, which is centered at ca. 25°N (Fig. 1), the primary adaptation of this species probably is to the seasonal climate of the subtropical zone (cf. Darlington, 1957, p. 413); captives kept in warm climates apparently are highly susceptible to heatstroke (Vickers, 1986, p. 522). However, the natural range of *M. mulatta* does extend to temperate or subalpine habitats in the north (Table 11). The range of humidity extremes tolerated by *M. mulatta* includes arid areas in western India and tidal swamps in eastern India and Bangladesh. Although most elevational records of *M. mulatta* are below 2000 m (Table 12), this species has been observed or collected as high as ca. 3200 m in Nepal (Hutu Forest) and ca. 4000 m in Qinghai Province, China (Baizha Plantation, Yushu Xian). Among vegetation types, broadleaf forest is the most common habitat of *M. mulatta*, but this species also occurs in mixed broadleaf-needleleaf forests and, least frequently, in needleleaf forests. *M. mulatta* often inhabits disturbed areas (Blanford, 1888b, p. 14; Mills, 1923, p. 222; McCann, 1933b, p. 810; Fooden, 1982b, p. 574; Richard et al., 1989, p. 569; Chalise, 1997, p. 31; Ruggeri & Timmins, 1997, p. 2), where it raids adjacent cultivated fields, and in India it frequently lives in populated areas as a commensal with humans (Southwick et al., 1961, p. 705; Prakash, 1962, p. 83).

Habitat variables apparently are related to geographic variation in the scream call of *M. mulatta* (Feng et al., 1997, p. 27).

Arboreality/Terrestriality

Judging from the few samples of *M. mulatta* for which daily arboreality/terrestriality activity patterns have been estimated, this species spends, on average, about 72% of its daylight hours on the ground and about 28% in trees (Table 13; cf. Blanford, 1888b, p. 14; McCann, 1933b, p. 810). Unsurprisingly, forest groups may tend to be somewhat more arboreal than nonforest groups, and in the Sundarbans tidal swamp forests, *M. mulatta* reportedly rarely descends from the trees (Mandal, 1964, p. 154; Mukherjee & Gupta, 1965, p. 145). In response to sudden danger, *M. mulatta* flees either on the ground (K. G. Gairdner, 14 April 1916, ZRC 4-188, field tag; Hingston, [1920], p. 244; Green, 1978, p. 154; Mukherjee, 1978b, p. 741; Dang, 1983, p. 1283; Poirier, 1985, p. 298) or into the trees (Mandal, 1964, p. 154; Mukherjee, 1969, p. 53; Fooden, 1971, p. 32; Lindburg, 1971, p. 45; Pirta & Singh, 1978, p. 277; Wada,

TABLE 11. Habitats reported for *Macaca mulatta*.

Sample area	Climate			Forest type			Cultivated field	Village, temple, etc.	Misc. other habitat types	References[1]
	Tropical	Subtropical	Temperate	Broadleaf	Mixed	Needleleaf				
Afghanistan			+	+		+	+			*1*
Pakistan			+	+		+	+			*2*
India, northern[2]	+	+	+	+	+	+	+	+		*3*
India, western[3]	+			+			+	+	Arid	*4*
India, central[4]	+			+			+	+		*5*
India, eastern[5]	+	+		+			+	+	Swamp	*6*
Nepal		+	+	+	+		+	+		*7*
Bhutan		+		+						*8*
Bangladesh	+			+			+	+	Swamp	*9*
Myanmar	+	+		+			+	+		*10*
Thailand	+			+				+		*11*
Vietnam	+			+						*12*
China, southern[6]	+	+		+			+			*13*
China, western[7]		+	+	+	+	+			Subalpine	*14*
China, central[8]		+		+	+		+			*15*
China, northern[9]		+	+	+	+		+			*16*
China: Xianggang (= Hong Kong)[10]	+			+	+					*17*

[1] Key to references: *1.* Puget, 1971, p. 200; Naumann & Nogge, 1973, p. 92. *2.* Hingston, [1920], p. 244; M. Iqbal, 5 Aug. 1964, USNM 353187, specimen tag; Roberts, 1977, pp. 6, 86; Melnick et al., 1984, p. 342; Pearl et al., 1987, p. 34. *3.* Wells in Lindsay, 1926, p. 599; Southwick et al., 1961a, p. 539; 1961b, p. 703; Neville, 1968b, p. 115; Mukherjee, 1969, p. 47; Lindburg, 1971, pp. 6, 8; Malhotra & Sahi, 1982, p. 25; Tak & Kumar, 1984, p. 203; Wada, 1984, p. 470; Seth & Seth, 1985, p. 53; Pirta et al., 1997, p. 102. *4.* Prakash, 1962, p. 83; Seth & Seth, 1985, p. 53; Fooden et al., 1981, p. 466. *5.* Krishnan, 1972, p. 541; Mukherjee, 1984, p. 260; Fooden et al., 1981, p. 466; Koyama & Shekar, 1981, p. 252; Kurup, 1992, p. 16. *6.* Mills, 1923, p. 222; McCann, 1933b, p. 810; Roonwal, 1950, p. 16; Mandal, 1964, p. 154; Southwick et al., 1964, p. 443; Mukherjee & Gupta, 1965, p. 145; Lahan & Sonowal, 1974, pp. 246, 275; Mukherjee, 1978a, p. 275; 1982, p. 77; Tilson, 1983, p. 399; Choudhury, [1991a], p. 32; 1996, p. 15; 1997, p. 10; Gupta, 1994, p. 104; Mukherjee et al., 1995, p. 25. *7.* N. A. Baptista in Hinton & Fry, 1923, p. 403; Chesemore, 1970, p. 164; Richie et al., 1978, p. 443; Teas et al., 1980, p. 249; Teas, 1983, pp. 212, 215; Chalise, 1997, p. 31. *8.* Choudhury, 1990, p. 125; Subba & Santiapillai, 1991–92, p. 32. *9.* Green, 1978, p. 154; Gittins & Akonda, 1982, p. 277; Khan, 1985, p. 31; Stanford, 1992, p. 188; Ahsan, 1994, p. 82; Feeroz et al., 1995, p. 75. *10.* G. C. Shortridge in Ryley, 1914, p. 715; H. C. Smith, 14 Jan. 1937, BM(NH) 1937.12.3.76, specimen tag; R. Kaulback, 28 Jan. 1939, BM(NH) 1950.372, specimen tag; Southwick & Southwick, 1985, p. 35. *11.* Coolidge, 1940, p. 129 (cf. Allen & Coolidge, 1940, p. 147); Fooden, 1971, p. 32; Aggimarangsee, 1992, p. 119; Srikosamatara, 1993, p. 34. *12.* Pham Nhat, FCXM, pers. comm., 30 Oct. 1995 (collected at Ban Bu, 11 Dec. 1992). *13.* Jiang Haisheng et al., 1991, p. 208; pers. obs., Guangxi: Tian'e County, 19–30 Oct. 1992; Zhang & Quan, 1996, p. 14. *14.* Weigold, 1935, p. 233; Kaulback, 1938, p. 91; Shen, 1963, p. 140; Zhang & Quan, 1996, p. 14. *15.* Wang Yingxiang, 11 July 1963, KIZ Coll. No. 631094, specimen tag; Poirier & Hu, 1983, p. 387; Tang Zieying, pers. comm., 19 Oct. 1985 (observed at Fujian: Fangdao Nature Reserve, July 1985; Zhang Minhua, ZMNH, pers. comm., 24 Oct. 1985 (observed at Zhejiang: Laodian, Aug. 1983); Kang Ximin, pers. comm., 24 Oct. 1985 (observed at Zhejiang: Zhidaikou, Aug. 1985); Wada et al., 1986, p. 81; Zhang & Quan, 1996, p. 14. *16.* Yao Jianchu, SIZ, pers. comm., 10 Oct. 1985 (observed at Shaanxi: Dahe and Dashuping, July 1974); Zhang et al., 1989, p. 376; Qu et al., 1993, p. 609; Southwick et al., 1996, p. 97; Zhang & Quan, 1996, p. 14. *17.* Southwick & Southwick, 1983, p. 18.

[2] Jammu and Kashmir, Himachal Pradesh, Punjab, Haryana, Delhi, Uttar Pradesh.

[3] Rajasthan, Gujarat, Maharashtra.

[4] Madhya Pradesh, Andhra Pradesh, Bihar, Orissa.

[5] West Bengal, Sikkim, Arunachal Pradesh, Assam, Nagaland, Meghalaya, Manipur, Tripura, Mizoram.

[6] Yunnan, Guangxi, Guangdong (including Hainan).

[7] Sichuan, Xizang, Qinghai.

[8] Fujian, Jiangxi, Hunan, Guizhou, Hubei, Anhui, Zhejiang.

[9] Henan, Shaanxi, Shanxi, Hebei (provincial population apparently extirpated in 1987).

[10] Population probably introduced (Herklots, 1951, p. 83; Marshall, 1967, p. 45).

TABLE 12. Frequency distribution of elevation records of *Macaca mulatta* (see Gazetteer, Appendix 2).

Elevation (m)	Number of records
0–500	155
500–1000	92
1000–1500	34
1500–2000	13
2000–2500	20
2500–3000	7
3000–3500	3
3500–4000	1
4000–4500	2
Total	327

1984, p. 494; Choudhury, [1991b], p. 123; Chopra et al., 1992, p. 81). Nighttime sleeping sites generally are in trees (Hingston, [1920], p. 244; Koford, 1963, p. 143; Mandal, 1964, p. 154; Shou et al., 1964, p. 60; Lindburg, 1971, p. 29; Vessey, 1973, p. 614; Makwana, 1978, p. 486; 1979b, p. 919), but groups in Afghanistan and northern China have been reported to sleep on the ground (Puget, 1971, p. 200; Qu et al., 1993, p. 616), and urban groups often sleep on the roofs of buildings (Ojha, 1977, p. 519; Mukherjee, 1969, p. 49; 1978a, p. 278). Two parturitions that have been observed in wild populations apparently occurred on the ground (Lindburg, 1971, p. 77; Mathur, 1994, p. 132).

Geographic variation in the relative frequency of terrestrial locomotion in *M. mulatta* reportedly is correlated with variation in morphology of the scapula, clavicle, and humerus (Yu et al., 1993, p. 87; Xue et al., 1998a, p. 147; 1998b, p. 29; 1999, p. 140).

Swimming

M. mulatta is capable of swimming across a water gap ca. 1 km wide (Drickamer & Vessey, 1974, p. 362; Varley & Vessey, 1977, p. 54; Sade, 1985, p. 28; Rawlins & Kessler, 1986b, p. 26). This species reportedly swims to search for food (Mukherjee & Gupta, 1965, p. 145; Dang, 1983, p. 1283), to escape from danger (Muir, 1916, p. 353; Southwick et al., 1974, p. 198; Berman, 1977, p. 763), and apparently also for pleasure and/or thermoregulation (McCann, 1933b, p. 810; Pilleri & Pilleri, 1982, p. 158; Malik & Menon, 1992, p. 39). In captivity, 2-day-old infants are capable of swimming (Riopelle, 1980, p. 262), and juveniles have been trained to swim underwater and to open a food box underwater (Anderson et al., 1992, p. 2; 1994, p. 356).

Group Size and Composition

The mean size of ca. 1,182 nonprovisioned or minimally provisioned groups for which data are available is ca. 32.2 individuals (Table 14); reported extremes are two and ca. 250 individuals. The size of nonprovisioned groups apparently tends to average largest (86.1–ca. 105.0 individ-

TABLE 13. Arboreal/terrestrial behavior recorded during daylight hours in samples of *Macaca mulatta*.

Habitat type	% Arboreality		Sample size	References[1]
	Mean ± SD	Extremes		
Northwestern Pakistan				
Forest	34	—	1 group	*1*
Northern India				
Ancient fort area	20	—	1 locality	*2*
Temple	27.8 ± 2.3	25.2–29.5	3 localities	*3*
Urban	17.1 ± 3.4	13.2–19.4	3 groups (2 localities)	*3*
Pond area	34.1 ± 13.9	10.2–46.5	5 localities	*3*
Roadside	21.0	—	1 locality	*3*
Canal bank	21.8	20.1–23.6	2 localities	*3*
Forest	40.2 ± 11.7	29.3–52.6	3 localities	*3*
Cayo Santiago, Puerto Rico (provisioned)				
Island colony	22.5 ± 5.6	16.5–27.7	3 individuals	*4*
All samples	28.4 ± 11.1	10.2–52.6	20 groups or localities	

[1] Key to references: *1*. Goldstein & Richard, 1989, p. 555. *2*. Malik, 1986, p. 111; Malik & Southwick, 1988a, p. 346. *3*. Chopra et al., 1992, p. 92. *4*. Fisler, 1967, p. 74.

uals) at the northern extremes of the species' geographic range—in Afghanistan and in the Chinese provinces of Qinghai and Henan (cf. Southwick et al., 1996, p. 102). Solitary males, living independently of nearby troops, have been observed in all parts of the species range (references cited in Table 14). Provisioned groups—one of which reportedly included 1,045 members—tend to average larger than nonprovisioned groups.

Nonprovisioned and provisioned groups of various sizes have been observed to split permanently into two autonomous daughter groups (Southwick & Beg, 1961, p. 390; Koford, 1966, p. 2; Missakian, 1973b, p. 622; Malik et al., 1984, p. 315; 1985, p. 417; Seth et al., 1986, p. 115; Malik, 1992, p. 8; Wang et al., 1996, p. 265). The smallest group known to have undergone fission included 28 individuals (daughter groups, 10 and 18 individuals) (Melnick & Kidd, 1983, p. 230). Fission probably usually occurs between matrilines (Chepko-Sade & Sade, 1979, p. 70).

In nonprovisioned and provisioned groups, the average sex ratio is approximately one sexually mature male to three sexually mature females (Table 15). The reported minimum ratio is approximately one male to 12 females, and the reported maximum ratio is approximately three males to two females.

Home Range, Day Range

Home range averages approximately 65 ha in 323 nonforest groups of *M. mulatta* and 196 ha in 129 forest groups (Table 16). Overlap of home ranges of adjacent troops is extensive (Lindburg, 1971, p. 32; Southwick et al., 1982, p. 623; Jiang Haisheng et al., 1991, p. 212) and may reach 100% (Makwana, 1979b, p. 919). Depending on local food and water sources and snow cover, different parts of a group's home range may be used in different seasons (Kurup, 1965, p. 193; Neville, 1968b, p. 113; Lindburg, 1977b, p. 241; Wada, 1984, p. 487; cf. Pearl et al., 1987, p. 36).

Day ranges average 1.15 km in nine nonforest groups and 1.91 km in ≥16 forest groups (Table 17).

Population Density

In areas inhabited by *M. mulatta*, the mean reported population density is 37.2 individuals/km^2 in forest habitats and 201.1 individuals/km^2 in nonforest habitats (Table 18). Among the nine forest habitat areas surveyed, mean population density was unusually high—120.0 individuals/km^2—on Hainan Dao, a tropical island off the southeastern coast of China. In the provisioned free-ranging population of *M. mulatta* that was introduced in 1938 on Cayo Santiago (area 0.152 km^2), Puerto Rico, the mean population density in 1983 had reached 7638.2 individuals/km^2.

Diet

The natural diet of *M. mulatta* is primarily vegetarian and includes fruits, seeds, flowers, leaves, buds, shoots, twigs, stems, roots, bark, pith, and resin of hundreds of species of angiosperms, gymnosperms, and fungi (Table 19). Angiosperm plants consumed include trees, shrubs, climbers, grasses, and other herbs. In six carefully surveyed geographic areas, the following minimum numbers of species of wild plants were discovered to be exploited for food by *M. mulatta*: northern Pakistan, 35 species (Goldstein & Richard, 1989, p. 552); Himachal Pradesh, northern India, 121 species (Pirta et al., 1997, p. 103); Uttar Pradesh, northern India, 150 species (Lindburg, 1977a, pp. 263–268; Makwana, 1979a, p. 244); central Nepal, 61 species (Marriott, 1978a, p. 759); Bangladesh, 41 species (Ahsan, 1994, p. 82); and Henan, east-central China, 73 species (Qu et al., 1993, p. 612). On Cayo Santiago, Puerto Rico, the provisioned introduced population of *M. mulatta* supplements its diet of monkey chow by feeding on 73 of the 163 plant species that grow on the island (Marriott et al., 1993, p. 332). In addition to exploiting wild plants, natural populations of *M. mulatta* opportunistically raid numerous species of cultivated crop plants (Makwana, 1979a, p. 247; Siddiqi & Southwick, 1980, p. 55; Poirier & Hu, 1983, p. 387; Malik & Southwick, 1988a, p. 339; Lal, 1990, pp. 113, 123; Gupta & Kumar, 1992, p. 227; Datta, 1996, p. 941). Seasonal variation has been noted in the species and parts of plants that are consumed (Lindburg, 1977a, p. 263; Wada, 1984, p. 480; Goldstein & Richard, 1989, p. 554; Fellowes, 1992, p. 132; Gupta & Kumar, 1992, p. 227; Qu et al., 1993, p. 611).

Plant consumption by *M. mulatta* apparently also varies geographically (Table 19). Judging from available data, grasses and other herbs provide most of the natural food for this species in

TABLE 14. Group size reported for *Macaca mulatta*.

Sample area	Group size			No. of groups	References[1]
	Mean	Minimum	Maximum		
Nonprovisioned or minimally provisioned groups					
Afghanistan	ca. 105.0	ca. 30	ca. 250	≥12	*1*
Pakistan	ca. 40.0	ca. 12	ca. 78	≥9	*2*
India, northern					
Jammu and Kashmir, Himachal Pradesh	ca. 30.8	4	50	78	*3*
Punjab, Haryana, Rajasthan	24.0	≤11	≥73	35	*4*
Uttar Pradesh	ca. 28.9	5	127	ca. 77	*5*
Various states[2]					
Urban	33.5	4	116	134	*6*
Rural	29.4	3	165	318	*6*
Forest	33.3	4	ca. 100	111	*6*
India, peninsular					
Gujarat, Maharashtra	58.4	ca. 20	ca. 100	8	*7*
Andhra Pradesh	ca. 37.8	6	ca. 250	36	*8*
India, eastern					
Orissa, Bihar	44.0	19	69	2	*9*
West Bengal	ca. 24.1	2	ca. 100	47	*10*
Assam	ca. 19.9	ca. 9	ca. 60	12	*11*
Tripura	26.6	≤5	≥76	162	*12*
Nepal	37.9	20	84	10	*13*
Bangladesh	16.1	2–3	84	68	*14*
Myanmar	15.3	9	26	3	*15*
Thailand	35.0	20	50	2	*16*
Vietnam	—	ca. 15	ca. 100	—	*17*
China					
Hainan Dao	58.9	20	110	18	*18*
Guangdong	21	—	—	1	*19*
Guangxi	33.8	11	73	6	*20*
Hunan	24	—	—	1	*19*
Hubei	ca. 35.0	—	—	3–4	*21*
Henan	86.1	35	125	23	*22*
Qinghai	ca. 100.0	—	—	12	*23*
Mean	ca. 32.3	2	ca. 250	1,188	
Provisioned groups					
India, northern					
Jammu and Kashmir, Himachal Pradesh	54.4	20	129	5	*24*
Delhi	51.2	19	123	6	*25*
Rajasthan	66	—	—	1	*26*
Uttar Pradesh	51.9	16	128	14	*27*
Various states[2]	135.2	20	1,045	16	*28*
India, peninsular					
Andhra Pradesh	ca. 43.8	8	ca. 100	4	*29*
India, eastern					
Manipur	128	—	—	1	*30*
Nepal[3]	54.6	≤29	138	12	*31*
China					
Hainan Dao	59.5	52	67	2	*32*
Henan	103.7	83	123	3	*33*
Mean	ca. 76.9	8	1,045	64	
Provisioned introduced population (Puerto Rico)					
Cayo Santiago	191.7	100	306	6	*34*

[1] Key to references: *1*. Puget, 1971, p. 199; Naumann & Nogge, 1973, p. 92. *2*. Roberts, 1977, p. 87; Iqbal & Rub, 1980, p. 214; Melnick et al., 1984, p. 344. *3*. Malhotra & Sahi, 1982, p. 27; Tak & Kumar, 1984, p. 203; Wada, 1984, p. 481; Pirta et al., 1997, p. 100. *4*. R. Singh, 1984, p. 50; Boonratana & Edwin, 1986, p. 110; Wolfe & Mathur, 1988, p. 537; Mathur & Manohar, 1990, p. 356; Chandel, 1992, p. 121; Gupta & Kumar, 1992, p. 226; Mathur, 1994,

northern Pakistan, whereas fruits and leaves of trees, shrubs, and climbers provide most of the food in Bangladesh and in the Indian states of Uttar Pradesh and Rajasthan. Similarly, gymnosperm seeds and needles are frequently consumed in northern parts of the geographic range (Afghanistan, Pakistan, Himachal Pradesh, Punjab, Henan, Hubei) but apparently are less frequently eaten elsewhere; this obviously is correlated with the geographic distribution of gymnosperms (Küchler, 1978, p. 17).

Larval and adult insects (Orthoptera, Isoptera, Hemiptera, Coleoptera, Lepidoptera, Hymenoptera) apparently are the most common animal food of *M. mulatta* (Lindburg, 1971, pp. 23, 33; Makwana, 1979a, pp. 243–247). Other known animal food includes spiders, crayfish, crabs, shellfish (?bivalves), fish, birds' eggs, and honeycombs (Table 19). In Vietnam, animal food is estimated to constitute 5–7% of the diet of *M. mulatta* (Dang, 1983, p. 1283). In parts of India, however, consumption of animal foods may be less frequent; at three Indian localities, feeding on insects was never observed (Siddiqi & Southwick, 1980, p. 55; Malik & Southwick, 1988a, p. 340; Gupta & Kumar, 1992, p. 227), and at another locality, *M. mulatta* individuals appeared reluctant to eat hen's eggs that were provided for them (Lindburg, 1971, p. 33).

Ingestion of soil (geophagy) by *M. mulatta* has been observed at three localities in India (Delhi, Rajasthan, Asarori), one locality in Nepal, and one locality in China (Table 19). At one of the Indian localities (Asarori), the soil was specifically identified as termite mound soil; monkeys at this locality also occasionally licked whitewash off painted walls. Geophagy also has been reported in the provisioned introduced population of *M. mulatta* on Cayo Santiago, Puerto Rico (Sultana & Marriott, 1982, p. 338); in these monkeys, selective ingestion of clay may function to prevent or ameliorate gastrointestinal disorders, including endoparasitism (Mahaney et al., 1995, p. 331; Knezevich, 1997, p. 73; cf. Bolton et al., 1998, p. 204).

For captive, relatively sedentary adult female *M. mulatta* (mean weight = 7.7 kg), the daily maintenance energy requirement is estimated to be 430 kcal (Henderson et al., 1993, p. 10; cf. Bourne, 1975, p. 99). This can be supplied by 150 g of monkey chow (10 large biscuits), supplemented by small amounts of fresh fruit and multivitamin tablets; such a diet has been shown to maintain body weight in singly housed monkeys for at least 11 weeks. In the free-ranging provisioned group on Key Lois, Florida, adults consume a daily average of ca. 225 g of chow in addition to naturally available food (Pucak et al., 1982, p. 207). Preliminary experimental evidence suggests that calorie-restricted diets may retard age-related pathology in captive *M. mulatta* (Couzin, 1998, p. 1018).

During the rainy season, water requirements of *M. mulatta* are met primarily by consumption of succulent plant food (Mukherjee & Gupta, 1965, p. 146; Lindburg, 1971, p. 35; Malik & South-

---

←

p. 132. *5.* Nolte, 1956, p. 180; Neville, 1968b, pp. 114, 117; 1968c, p. 15; Mukherjee, 1969, p. 48; Lindburg, 1971, p. 13; Singh, 1975, p. 472; Southwick & Siddiqi, 1977b, p. 342; Pirta, 1977–78, p. 126; 1982, p. 401; Singh, 1982, p. 8; Laws & Laws, 1984, p. 35; Imam & Yahya, 1995, p. 4. *6.* Dolinow & Lindburg, 1980, p. 211; Seth & Seth, 1993, p. 55; cf. Southwick et al., 1965, p. 120, and Mukherjee & Mukherjee, 1972, p. 67. *7.* Fooden et al., 1981, p. 466. *8.* Fooden et al., 1981, p. 466; Kurup, 1992, p. 15. *9.* Krishnan, 1972, p. 541; Mukherjee, 1984, p. 260. *10.* Mandal, 1964, p. 164; Southwick et al., 1964, p. 446; Saha, 1974, p. 211; Southwick et al., 1974, p. 187; Mukherjee et al., 1995, p. 27; cf. de Poncins, 1935, p. 846, and Mukherjee & Gupta, 1965, p. 145. *11.* Mukherjee, 1978b, p. 741; Pilleri & Pilleri, 1982, p. 158; Choudhury, [1991a], p. 32; [1991b], p. 123. *12.* Mukherjee, 1982, pp. 73, 80; Gupta, 1994, p. 104. *13.* Richie et al., 1978, p. 443; Teas et al., 1980, p. 250; Marriott, 1988, p. 128. *14.* Green, 1978, p. 153; Oppenheimer et al., 1983, pp. 195, 198; Khan, 1986, p. 38; Stanford, 1991, p. 17; Feeroz et al., 1995, p. 75; cf. Hendrichs, 1975, p. 171, and Ahsan, 1994, p. 83. *15.* Southwick & Southwick, 1985, p. 35. *16.* Fooden, 1971, p. 32. *17.* Dang, 1983, p. 1283. *18.* Southwick et al., 1996, p. 100. *19.* Feng et al., 1997, p. 27. *20.* Wang et al., 1996, p. 266. *21.* Poirier, 1983, p. 128. *22.* Qu et al., 1993, p. 614; Southwick et al., 1996, p. 100. *23.* Tan & Poirier, [1991], p. 130. *24.* Malhotra & Sahi, 1982, p. 27; Wada, 1984, p. 481. *25.* Southwick et al., 1961a, p. 543; Malik et al., 1984, p. 315. *26.* Singh, 1992, p. 192. *27.* Southwick et al., 1961a, p. 543; Pirta, 1984, p. 281. *28.* Seth & Seth, 1993, p. 55. *29.* Fooden et al., 1981, p. 467. *30.* Mukherjee, 1978a, p. 277. *31.* Southwick et al., 1980, p. 165; 1982, p. 624; Teas et al., 1982, p. 65. *32.* Southwick et al., 1996, p. 100. *33.* Qu et al., 1993, pp. 610, 614. *34.* Rawlins & Kessler, 1986c, p. 55.

[2] Pooled data reported for groups observed in several northern Indian states; some of these groups probably also are included in reports cited in preceding entries for northern Indian states.

[3] Cf. Chalise & Ghimire, 1998, pp. 11–15.

TABLE 15. Ratio of sexually mature males to sexually mature females reported in groups of *Macaca mulatta*.

Sample area	Pooled sex ratio	Group sex ratios		Number of sexually mature individuals	No. of groups	References[1]
		Minimum	Maximum			
Nonprovisioned or minimally provisioned groups[2]						
Pakistan	0.54	?	?	126	7	*1*
India, northern						
Jammu and Kashmir, Himachal Pradesh	0.50	0.29	1.43	1,029	68	*2*
Haryana, Rajasthan	0.26	0.12	0.50	103	4	*3*
Uttar Pradesh	0.39	0.18	1.00	691	43	*4*
Various states[3]						
Urban	0.34	≤0.16	≥1.17	1,790	134	*5*
Rural	0.39	≤0.21	≥0.71	4,053	318	*5*
Forest	0.34	≤0.18	≥0.60	1,422	111	*5*
India, peninsular						
Andhra Pradesh	0.33	0.08	0.64	129	11	*6*
India, eastern						
Orissa, West Bengal	0.37	0.09	1.00	629	44	*7*
Tripura	0.47	≤0.25	≥0.67	1,986	174	*8*
Nepal[4]	0.35	0.18	0.50	131	6	*9*
Bangladesh	0.29	0.14	1.00	208	16	*10*
Myanmar	0.50	?	?	46	3	*11*
Mean	0.39	0.08	1.43	12,343	939	
Provisioned groups						
India, northern						
Jammu and Kashmir, Himachal Pradesh	0.47	0.30	0.75	109	3	*12*
Delhi	0.38	0.25	0.75	95	6	*13*
Uttar Pradesh	0.48	0.29	0.85	375	14	*14*
Various states[3]	0.26	≤0.21	≥0.47	961	16	*15*
India, eastern						
Manipur	0.47	—	—	56	1	*16*
Nepal	0.26	?	?	289	12	*17*
China: Henan	0.30	0.21	0.48	82	2	*18*
Mean	0.35	≤0.21	0.85	1,967	54	

[1] Key to references: *1.* Melnick & Pearl, 1987, p. 128; cf. Igbal & Rub, 1980, p. 214; Goldstein & Richard, 1989, p. 532, and Rab et al., 1991, p. 220. *2.* Camperio Ciani, 1984, p. 373; Malhotra & Sahi, 1984, p. 78; Pirta et al., 1997, p. 100. *3.* Prakash, 1962, p. 83; Singh et al., 1984, p. 265; Chandel, 1992, p. 121; Mathur, 1994, p. 132; cf. Mathur & Manohar, 1990, p. 356. *4.* Neville, 1968b, p. 114; Mukherjee, 1969, p. 48; Lindburg, 1971, p. 13; Singh, 1975, p. 472; Pirta, 1977–78, p. 126; Pirta & Singh, 1982, p. 20; Imam & Yahya, 1995, p. 4. *5.* Dolinow & Lindburg, 1980, p. 211; Seth & Seth, 1983, p. 65; 1993, p. 55; Seth et al., 1983, p. 40; Chopra et al., 1992, p. 86; cf. Southwick et al., 1965, p. 120, and Mukherjee & Mukherjee, 1972, p. 67. *6.* Kurup, 1992, p. 15. *7.* Mandal, 1964, p. 164; Southwick et al., 1964, p. 446; 1974, p. 187; Saha, 1974, p. 211; Mukherjee, 1984, p. 260; Mukherjee et al., 1995, p. 27. *8.* Mukherjee, 1982, p. 80; Gupta, 1994, p. 104. *9.* Richie et al., 1978, p. 443; Teas, 1983, pp. 217, 221; Marriott, 1988, p. 128. *10.* Oppenheimer et al., 1983, pp. 195, 198. *11.* Southwick & Southwick, 1985, p. 35. *12.* Camperio Ciani, 1984, p. 373; Malhotra & Sahi, 1984, p. 78. *13.* Southwick et al., 1961a, p. 543; Malik et al., 1984, p. 315. *14.* Southwick et al., 1961a, p. 543; Pirta & Singh, 1982, p. 20. *15.* Seth & Seth, 1993, p. 55; Chopra et al., 1992, p. 86. *16.* Mukherjee, 1978a, p. 277. *17.* Teas et al., 1981a, p. 119; 1982, p. 65; cf. Johnson et al., 1988, p. 179; Chalise & Ghimire, 1998, pp. 14, 15. *18.* Qu et al., 1993, pp. 613, 615.

[2] Cf. Wang et al., 1996, pp. 267, 268.

[3] Pooled data reported for groups observed in several northern Indian states; some of these groups probably also are included in reports cited in preceding entries for northern Indian states.

[4] Cf. Chalise, 1997, p. 31; Chalise & Ghimire, 1998, p. 15.

wick, 1988a, p. 345). During the dry season, these monkeys move as a group to drink at streams or other open water sources, often in the morning and evening (N. A. Baptista in Hinton & Fry, 1923, p. 403; Lindburg, 1971, p. 36; Puget, 1971, p. 200; Naumann & Nogge, 1973, p. 92; Makwana, 1979b, p. 919). Drinking apparently is usually by oral suction, but monkeys also sometimes

TABLE 16. Home range area reported for groups of *Macaca mulatta*.

Sample area	Habitat	Home range area (ha)			Mean group size	No. of groups	References[1]
		Mean	Minimum	Maximum			
Nonprovisioned or minimally provisioned groups							
India, northern							
Himachal Pradesh	Forest	178	60	260	42.2	4	*1*
Haryana	Rural	5	—	—	26	1	*2*
Uttar Pradesh	Urban	ca. 32	ca. 5	60	36.2	4	*3*
	Rural	ca. 10	ca. 10	ca. 10	36.0	2	*4*
	Forest	ca. 449	56	ca. 1,560	42.3	21	*5*
Various states[2]	Urban	95	≤6	≥100	34.7	116	*6*
	Rural	49	≤6	≥162	35.7	199	*6*
	Forest	129	<129	≥2,020	35.4	79	*6*
India, eastern							
Orissa	Urban	3	—	—	69	1	*7*
Nepal	Forest	70	—	—	84	1	*8*
Bangladesh	Forest	≥50	?	?	37.0	2	*9*
Vietnam	Forest	ca. 250	100	400	?	?	*10*
China							
Hainan Dao	Forest	37	16	72	ca. 60	19[3]	*11*
Henan	Forest	1,333	1,100	1,500	60.0	3	*12*
Mean	Nonforest	ca. 64.8	3	≥162	35.4	323	
Mean	Forest	ca. 195.9	16	≥2,020	ca. 41.3	129	
Provisioned groups							
India, northern							
Rajasthan	Forest[4]	400	—	—	68	1	*13*
Uttar Pradesh	Temple	1.7	1.5	2	98.5	2	*14*
Various states[2]	Temple	76	≤70	≥230	135.2	16	*6*
India, eastern							
Manipur	Temple	8	—	—	128	1	*15*
Nepal	Temple	?	2.5	24	54.6	12	*16*
China: Henan	Forest	2,000	1,800	2,200	103.0	2	*12*
Mean	Temple	64.6	1.5	≥230	131.0	19	
Mean	Forest	1466.7	400	2,200	91.3	3	

[1] Key to references: *1.* Wada, 1984, p. 482. *2.* Singh et al., 1984, p. 264. *3.* Neville, 1968b, p. 118; Pirta & Singh, 1980, p. 516. *4.* Mukherjee, 1969, p. 51. *5.* Neville, 1968b, p. 118; Lindburg, 1971, p. 28; Pirta & Singh, 1982, p. 20. *6.* Seth et al., 1983, p. 40; Chopra et al., 1992, pp. 86, 92; Seth & Seth, 1993, p. 55. *7.* Mukherjee, 1984, p. 260. *8.* Marriott, 1988, p. 129. *9.* Stanford, 1991, p. 17; cf. Ahsan, 1994, p. 83. *10.* Dang, 1983, p. 1283. *11.* Jiang Haisheng et al., 1991, p. 212. *12.* Qu et al., 1993, p. 614. *13.* Singh, 1992, p. 192. *14.* Pirta & Singh, 1982, p. 20. *15.* Mukherjee, 1978a, p. 278. *16.* Southwick et al., 1982, p. 623; Teas et al., 1980, p. 253.

[2] Pooled data reported for groups observed in several northern Indian states; some of these groups may also be included in reports cited in preceding entries for northern Indian states.

[3] Includes two provisioned groups.

[4] Near temples.

dip their hands into a water source and lick the water from their hands (Lindburg, 1971, p. 36; Morrison & Menzel, 1972, p. 54; Makwana, 1979a, p. 251; Malik & Menon, 1992, p. 39). Adults in the provisioned group on Key Lois, Florida, drink ca. 500 ml of water per day (Pucak et al., 1982, p. 207).

In indigenous *M. mulatta* populations studied, the average proportion of waking hours that are spent in feeding varies from 15.8% to 45.0% (Table 20). Feeding activity generally peaks twice a day—in the morning, shortly after waking, and in the afternoon, before roosting for the night (Siddiqi & Southwick, 1980, p. 60; Jiang et al., 1988b, p. 295; Malik & Southwick, 1988b, p. 101; Gupta & Kumar, 1992, p. 229). In winter, the length of the midday feeding pause tends to be reduced (Lindburg, 1977b, p. 231; Pearl et al., 1987, p. 38).

Predators

Observers have recorded attacks on *M. mulatta* by raptorial birds, dogs, weasels, leopards, and ti-

TABLE 17. Day range reported for groups of *Macaca mulatta*.

Sample area	Habitat	Day range (km)			Mean group size	Number of groups observed	References[1]
		Mean	Minimum	Maximum			
India							
Himachal Pradesh	Urban	1.11	0	3.1	27.8	2	*1*
	Forest	1.22	0	4.6	41.2	ca. 5	*1*
Rajasthan	Urban	1.75	?	≥2.0	46.0	2	*2*
	Rural	0.90	?	≥1.0	49.4	2	*2*
	Forest	4.00	?	≥4.0	104	1	*2*
Uttar Pradesh	Urban	0.93	?	≥1.0	56.3	3	*2, 3*
	Forest	2.04	≤0.4	≥3.5	≥50.4	≥10	*2, 3, 4*
Bangladesh	?	2.00	?	?	15.0	?	*5*
China: Hainan Dao	Forest	?	≤1.0	2.3	~60	?	*6*
Mean	Nonforest	1.15	0	3.1	46.1	9	
Mean	Forest	1.91	0	4.6	≥50.9	≥16	

[1] Key to references: *1*. Wada, 1984, pp. 481, 488, 491. *2*. Seth & Seth, 1983, p. 64 (day range units reported as km^2). *3*. Neville, 1968b, p. 118. *4*. Lindburg, 1971, p. 25; Makwana, 1978, p. 488. *5*. Ahsan, 1994, p. 83. *6*. Jiang et al., 1988b, p. 296.

gers (see below); additional reported predators are sharks and crocodiles (in the Sundarbans tidal swamps) and snakes (Mukherjee & Gupta, 1965, p. 145; Seth et al., 1983, p. 42). In Uttar Pradesh, India, hawks were observed to kill young rhesus monkeys (Pirta & Singh, 1978, p. 275; cf. Lindburg, 1971, p. 43), and in Henan, China, an eagle was observed to injure two juveniles (Qu et al., 1993, p. 610). The sight of raptorial birds is known to provoke alarm responses in *M. mulatta*, both in India (Roonwal & Mohnot, 1977, p. 134; Singh & Pirta, 1983, p. 85) and in the introduced population on Cayo Santiago, Puerto Rico (Chapais & Schulman, 1980, p. 740). At a temple in India, rhesus monkeys attacked and killed two hawks (Pirta, 1984, pp. 271, 276).

Attacks by dogs that resulted in injury or death to *M. mulatta* have been documented in Uttar Pradesh and Delhi, India (Lindburg, 1971, p. 73; Makwana, 1978, p. 485; Johnson & Southwick, 1984, p. 211; Malik et al., 1985, p. 418); Champion (1929, p. 424) noted that *M. mulatta* individuals invariably called in the direction of his dog when he and the dog walked together in the forest. Fatal attacks by weasels on *M. mulatta* infants have been reported by Pirta and Singh (1978, p. 275; cf. Singh & Pirta, 1983, p. 85), who also report an alarm response to a weasel by these monkeys. Leopards are a major predator of *M. mulatta* (Champion, 1934, p. 120; Roberts, 1977, p. 88; Roonwal & Mohnot, 1977, p. 134). Predation by tigers, alarm responses, and the apparent mobbing of a tiger by *M. mulatta* have been reported in India and Bangladesh (Mandal, 1964, p. 157; Hendrichs, 1975, p. 184; Lindburg, 1977b, p. 242).

Experimental study of captive *M. mulatta* indicates that fearful avoidance of snakes is much stronger in wild-reared individuals than in laboratory-reared individuals (Joslin et al., 1964, p. 349; Mineka et al., 1980, p. 655). Naive, fearless laboratory-reared monkeys may become fearful of snakes as a result of exposure to the fearful behavior of other monkeys (Mineka et al., 1984, p. 363; Cook et al., 1985, p. 595). In captive *M. mulatta*, fear of snakes seems to be greater in dominant individuals than in subordinate individuals (Brennan & Anderson, 1988, p. 357; Peugeot et al., 1994, p. 88).

Intergroup Behavior

The behavioral interactions of adjacent groups of *M. mulatta* appear to be highly variable (Table 21). Some observers report frequent intergroup contacts, whereas others report that intergroup contacts are rare and apparently avoided (Malik et al., 1984, p. 315; Makwana, 1979b, p. 920). Although harmonious intergroup encounters, including intergroup matings, have been observed, most contacts seem to arouse antagonism, which may range from tense behavior or relatively mild branch shaking to violent physical combat (Southwick et al., 1965, p. 143; Neville, 1968c, p. 15; Lindburg, 1971, p. 37). At some localities, both peaceful and hostile contacts have been observed between the same groups. During contacts, larger

TABLE 18. Population density reported for *Macaca mulatta*.

Sample area	Habitat	Population density (individuals/km²)			Number of groups surveyed	References[1]
		Mean	Minimum	Maximum		
India, northern						
Himachal Pradesh	Mixed[2]	109.0	21.2	217.0	>5	*1*
Delhi	Ancient fort area[3]	51.0	32.0	70.2	6	*2*
Rajasthan	Urban	385.4	3.1	418.4	14	*3*
	Temple[3]	947.6	882.7	1,012.6	6	*3*
Uttar Pradesh	Urban	752.0	—	—	≥2	*4*
	Rural	44.8	—	—	5	*5*
	Forest	27.0	18.2	57.1	≥16	*6*
Various states[4]	Urban	154.2	—	—	116	*7*
	Rural	192.5	≤85.9	≥356.4	199	*7*
	Forest	34.2	—	—	79	*7*
	Temple[3]	243.6	—	—	16	*7*
India, eastern						
Assam	Forest	28	—	—	—	*8*
Nepal	Forest	9.3	—	—	8	*9*
Bangladesh	Forest	21.1	5.0	52.0	>33	*10*
China						
Hainan Dao	Forest[5]	120.0	≤50.0	≤250	20	*11*
Guangdong	Forest	48.0	—	—	1	*12*
Guangxi	Forest	55.6	—	—	14	*13*
Hunan	Forest	12.0	—	—	1	*12*
Henan	Forest[5]	7.2	—	—	ca. 25	*14*
Mean	Nonforest	201.1	3.1	1,012.6	≥364	
Mean	Forest	36.2	≤5.0	≤250	>197	
Introduced provisioned populations (U.S.A.)						
South Carolina						
Morgan Island	Island	2,320	—	—	—[6]	*15*
Florida						
Key Lois	Island	1,270	—	—	—[7]	*16*
Racoon Key	Island	1,790	—	—	—[8]	*16*
Puerto Rico						
Cayo Santiago	Island	7,638.2	—	—	6	*17*

[1] Key to references: *1.* Camperio Ciani, 1984, p. 373; Ross et al., 1993, p. 161; cf. Pirta et al., 1997, p. 100. *2.* Malik, 1989b, p. 581. *3.* Mathur & Manohar, 1990, pp. 353, 355. *4.* Neville, 1968b, p. 120. *5.* Lindburg, 1969, p. 1176. *6.* Neville, 1968b, p. 120; Pirta, 1977–78, p. 128. *7.* Seth & Seth, 1993, p. 56. *8.* Chetry et al., 1998, abstract no. 249. *9.* Teas et al., 1980, p. 250. *10.* Hendrichs, 1975, p. 179; Green, 1978, p. 156; Khan, 1986, p. 38. *11.* Jiang Haisheng et al., 1991, p. 209; 1998, p. 101; Southwick et al., 1991, p. 27. *12.* Feng et al., 1997, p. 27. *13.* Wang et al., 1996, p. 265. *14.* Southwick et al., 1996, p. 100. *15.* Taub & Mehlman, 1989, p. 163. *16.* Lehman et al., 1994, p. 118. *17.* Rawlins & Kessler, 1986b, p. 13; 1986c, p. 48.

[2] Includes nonforest and forest groups; some of the nonforest groups are provisioned.

[3] Provisioned.

[4] Pooled data for groups observed in several northern Indian states; some of these groups may be included in reports cited in preceding entries for northern Indian states.

[5] Includes two provisioned groups.

[6] 3,758 individuals.

[7] Ca. 699 individuals.

[8] Ca. 1,030 individuals.

groups almost invariably displace smaller groups. In crowded introduced provisioned free-ranging populations, intergroup contacts are more frequent than in indigenous populations, but these contacts are otherwise generally similar (Tables 18,21).

In *M. mulatta*, as in other species of macaques, males nearly always leave their natal group before reaching sexual maturity and join a nearby group (Neville, 1968a, p. 772; Lindburg, 1969, p. 1177; Melnick et al., 1984, p. 238; Teas, 1984, p. 241; Singh, 1986, p. 607); subsequently, these males apparently transfer to other nearby groups at intervals ranging from a few months to a few years. Most intergroup transfers apparently coincide ei-

TABLE 19. Foods reported eaten by *Macaca mulatta*. Dietary proportions are indicated where data are available.

	Angiosperms					
	Trees, shrubs, climbers					
Sample area	**Fruits, seeds**	**Flowers**	**Leaves**	**Other**[2]	**Grasses**	**Other herbs**
Afghanistan	+		+			
Pakistan[5]	1.7%	5.5%	7.4%	1.0%	12.7%[6]	48.5%[6]
	+			+	+	+
India						
Himachal Pradesh	+				+	+
Punjab			+			
Haryana	+	+	+	+	+	+
Delhi	+		+		+	+
Rajasthan[8]	59%[9]	10%[9]	30.6%[9]	+		
	+	+	+		+	+
Uttar Pradesh	+	+	+	+	+	+
Asarori	ca. 70%	+	+	+	+	+
Asarori/Dhulkot	36.3%	9.2%	33.7%	+	+	18.8%[14]
Chhatari-do-Raha	+[16]		+[16]	+[16]	1.0%	
Sumera Fall	+[18]	+[18]	+[18]	+[18]	6.4%	
Orissa				+[19]		
West Bengal	+		+		+	+
Assam						
Manipur					+	
Tripura						
Nepal	+	+	+	+	+	+
Bangladesh	53%[9]		47%[9]			
Thailand	+	+	+			+
Vietnam	+[9,23]		+[9,23]	+[9,23]		
China						
Hainan				+[9,19]		
Xianggang (= Hong Kong)[25]	+		+		+	
Sichuan						
Hubei	+	+				
Henan	+	+	+	+		+
Hebei[27]	+		+	+		

[1] Pine, fir, cedar, yew.
[2] Includes roots, bark, shoots, reeds, stems, twigs, buds, pith, and resin.
[3] Includes bark, cones, shoots, and exudate.
[4] Key to references: *1.* Puget, 1971, pp. 200, 202. *2.* Goldstein & Richard, 1989, p. 552. *3.* Roberts, 1977, p. 87; Pearl et al., 1987, pp. 32, 37. *4.* Wada, 1984, pp. 479, 481; Lal, 1990, pp. 113, 123; Pirta et al., 1997, p. 103. *5.* Lindburg, 1977a, p. 268. *6.* Gupta & Kumar, 1992, p. 227. *7.* Malik & Southwick, 1988a, p. 339; 1988b, pp. 102, 107. *8.* Ojha, 1980, p. 249. *9.* Wolfe, 1992, p. 45. *10.* Roonwal, 1956, p. 171; Oboussier & von Maydell, 1960, p. 145; Southwick et al., 1965, p. 129; Neville, 1968b, pp. 113–116, 122; Mukherjee, 1969, p. 52; Lindburg, 1971, p. 33; 1977a, pp. 265, 268; 1977b, p. 234. *11.* Lindburg, 1971, pp. 23, 33; 1977a, p. 262; 1977b, p. 232. *12.* Makwana, 1979a, pp. 242–251. *13.* Siddiqi & Southwick, 1980, pp. 54–59. *14.* Mukherjee, 1984, p. 260. *15.* Mandal, 1964, pp. 156, 158; Mukherjee & Gupta, 1965, p. 146; Sanyal, 1983, p. 3; Datta, 1996, p. 941. *16.* Gee, 1961, p. 6. *17.* Mukherjee, 1978a, p. 278. *18.* Mukherjee, 1977, p. 111. *19.* Marriott, 1978a, p. 759; 1988, p. 138; Teas, 1983, p. 222; Chalise, 1997, p. 31. *20.* Hendrichs, 1975, p. 184; Green, 1978, p. 154; Ahsan, 1994, p. 83. *21.* Fooden, 1971, p. 32; Seeley et al., 1982, p. 58; Aggimarangsee, 1992, p. 119. *22.* Dang, 1983, p. 1283. *23.* Jiang Haisheng et al., 1991, p. 208; Southwick et al., 1996, p. 102. *24.* Fellowes, 1992, p. 131; Southwick & Manry, 1987, p. 48; Southwick & Southwick, 1983, p. 22; Corlett, 1996, p. 830; Bolton et al., 1998, p. 197. *25.* Weigold, 1924, p. 72. *26.* Poirer & Hu, 1983, p. 387; Poirier, 1985, p. 298. *27.* Qu et al., 1993, pp. 610–613; Southwick et al., 1996, p. 102. *28.* Zhang et al., 1989, p. 377.
[5] Residual 12.6% of diet not specified.
[6] Composite grass/clover percentage here arbitrarily split equally between grass and clover.
[7] Hen's eggs, provided by humans.
[8] Residual 0.4% of diet not specified.
[9] May include herbs.
[10] Birds' eggs.
[11] Includes termites, grasshoppers, ants, beetles, and honeycomb from nest of wild bees.
[12] Experimentally provisioned hen's eggs were eaten by some monkeys after initial hesitation.

TABLE 19. *Extended.*

Gymnosperms[1]									
Seeds	Leaves	Other[3]	Fungi	Cultivated plants	Provisioned food	Insects, spiders, crustaceans	Other animal food	Soil	References[4]
		+		+		+			*1*
	10.4%	0.2%							*2*
+	+	+	+			+			*3*
+				+	+				*4*
+									*5*
				+					*6*
				+	59%		+[7]	+	*7*
				+		+	+[10]	+	*8*
					+				*9*
		+	+	+	+	+[11]			*10*
			+			+	+[12]	+[13]	*11*
			2.0	+		+		+[15]	*12*
				10.2%	82.9%		[17]		*13*
				17.5%	29.1%		[17]		*13*
				+	+				*14*
			+	+		+			*15*
				+					*16*
					>50%				*17*
				+					*18*
				+	+	+		+	*19*
				+		+	+[20]		*20*
				+	+	+[21]	+[22]		*21*
						5%–7%[24]	+		*22*
					+				*23*
		+			67%	+[26]		+	*24*
				+					*25*
				+					*26*
+					+				*27*
+				+					*28*

[13] Termite mound soil with high iron content.
[14] Includes grass.
[15] Termite mound soil; whitewash licked off wall.
[16] Total angiosperm nonherb dietary proportion, 5.9%.
[17] Crow killed by monkeys at Chhatari-do-Raha or Sumera Fall, not eaten; unsuccessful attempt to catch another bird also observed.
[18] Total angiosperm nonherb dietary proportion, 47.0%.
[19] Plant parts eaten by monkeys are not specified.
[20] Fish.
[21] Brood nest section was removed from wild bee nest by monkeys.
[22] Bird's egg.
[23] Fruits constitute 80% of diet in winter; leaves constitute most of diet in summer.
[24] Includes insects, crayfish, shellfish, and fish.
[25] Population probably introduced (Herklots, 1951, p. 83).
[26] Unspecified invertebrates, presumably arthropods.
[27] Population now extinct.

ther with the spring birth peak (Neville, 1968a, p. 772; Melnick et al., 1984, p. 238) or with the fall mating peak (Lindburg, 1969, p. 1177). One juvenile female was observed to transfer to a new group (Makwana, 1978, p. 485); this transfer occurred in the spring.

In provisioned introduced populations, male transfer is approximately four times more frequent during the peak mating season than during other seasons (Vandenbergh, 1967, p. 189; Boelkins & Wilson, 1972, p. 132). A recent study indicates that the age at which a male transfers to another

TABLE 20. Daily waking-hour[1] time budget estimates (%) for *Macaca mulatta*.[2]

Sample area	Feeding[3]	Locomotion	Resting[4]	Social behavior[5]	Other	References[6]
Pakistan: forest	45	10	35	10	—	*1*
India, northern						
Delhi: fort site	22.8	18.6	33.7	20.8	4.1	*2*
Uttar Pradesh: forest[7]	32.3	44.8	22.9	—	—	*3*
Various states						
Temple	26.7	15.8	36.7	18.6	2.2	*4*
Urban	21.9	19.3	36.7	19.7	2.4	*4*
Pond	28.0	11.2	39.3	20.5	1.0	*4*
Roadside	31.3	14.3	34.7	19.3	0.4	*4*
Canal bank	25.0	19.9	40.0	13.0	2.1	*4*
Forest	33.6	24.2	35.1	5.6	1.5	*4*
Nepal						
Temple[8]	27	25	28	21	1	*5*
Forest	15.8	39.4	27.0	15.1	2.7	*6*
Introduced provisioned population (U.S.A.)						
Cayo Santiago	13.3	23.1	36.3	25.0	2.3	*7*

[1] Ca. 13 hr/day (Marriott, 1978b, p. [27]; Malik & Southwick, 1988b, p. 101).
[2] Cf. Wolfe, 1992, p. 48.
[3] Includes foraging and drinking.
[4] Includes self-grooming and category "Look."
[5] Includes allogrooming and playing.
[6] Key to references: *1*. Goldstein & Richard, 1989, p. 547. *2*. Malik & Southwick, 1988b, p. 101; Malik & Mennon, 1992, p. 35. *3*. Neville, 1968b, p. 120. *4*. Chopra et al., 1992, p. 92. *5*. Teas et al., 1980, p. 254. *6*. Marriott, 1988, p. 134. *7*. Marriott, 1988, p. 134; cf. Fisler, 1967, p. 72.
[7] Means for five groups (extremes: feeding, 10.6%–47.8%; locomotion, 32.8%–71.2%; resting, 15.6%–36.5%).
[8] Percentages reported as rounded whole numbers (sum 102%).

group is positively correlated with the level of central nervous system serotonin activity (Mehlman et al., 1995, p. 909).

Interspecific Behavior

INTRAGENERIC—*M. mulatta* is broadly sympatric with *M. assamensis*, *M. thibetana*, and *M. arctoides*; it is more narrowly sympatric with *M. nemestrina*; and it is marginally sympatric or parapatric with *M. radiata* and *M. fascicularis* (Fooden, 1980, p. 4). Ecologically, *M. assamensis*, *M. thibetana*, *M. arctoides*, and *M. nemestrina* generally prefer primary broadleaf evergreen forest, whereas *M. mulatta*, *M. radiata*, and *M. fascicularis* generally prefer secondary or deciduous forest and disturbed habitats (Fooden, 1982b, p. 574).

Groups of *M. mulatta* and *M. assamensis* have been observed in close proximity in eastern Nepal (one locality; J. A. McNeely in Fooden, 1982a, p. 26), West Bengal, India (two localities; Khajuria, 1966, p. 284; Mukherjee et al., 1995, p. 30), and western Thailand (one locality; Eudy, 1979, pp. 92, 97, 199). However, these apparently were casual contacts, and no mixing of *M. mulatta* and *M. assamensis* groups was observed at any of these localities. *M. mulatta* and *M. assamensis* also reportedly coexist at one locality in Bangladesh (Feeroz et al., 1995, p. 76); no further information is available concerning this interspecific association.

In China, the local distribution of *M. mulatta* tends to be negatively correlated with that of *M. thibetana*, which generally inhabits higher elevations (Wada et al., 1986, p. 93). However, three mixed groups have been reported in Zhejiang Province (Kang Ximin, ZMNH, pers. comm., 24 October 1985), and another possibly mixed group has been reported in Jiangxi province (David, 1875, vol. 2, p. 256). In the Zhejiang groups (Zhoucun, January 1985, two groups; Zhidaikou, August 1985, one group), most members were *M. mulatta*. In the possibly mixed group in Jiangxi (Kuatun, ca. 20 km northwest, 8 October 1873), 10 individuals were *M. thibetana*, and one may have been *M. mulatta*.

In Tripura, eastern India, a group of *M. mulatta* and a group of *M. arctoides* have been observed

TABLE 21. Intergroup contact behavior reported in *Macaca mulatta*.

Sample area	Habitat	Frequency of contacts		Mood of contacts		Larger group displaces smaller group	References[1]
		Common	Rare	Peaceful	Hostile		
Pakistan	Forest	+		+		+	*1*
India							
Himachal Pradesh	Temple	+					*2*
	Rural		+	+			*3*
Delhi	Fort site		+			+	*4*
Uttar Pradesh							
Aligarh	Temple	+		+	+	+	*5*
Asarori Forest	Forest		+	+	+	+	*6*
Bareilly	Roadside		+				*7*
Dehra Dun	Rural	+		+	+	+	*8*
Haldwani area	Forest				+	+	*9*
Kaukori[2]	Rural				+		*10*
West Bengal	Swamp				+		*11*
China: Henan	Forest				+		*12*
Provisioned introduced populations (U.S.A.)							
Puerto Rico							
Cayo Santiago	Island	+		+	+	+	*13*
La Cueva I.	Island	+		+	+	+	*14*
South Carolina							
Morgan I.	Island	+		+	+		*15*

[1] Key to references: *1.* Melnick et al., 1984, p. 237; Goldstein & Richard, 1989, p. 563. *2.* Edwin & Chopra, 1984, p. 312. *3.* Wada, 1984, p. 489. *4.* Malik et al., 1984, p. 315. *5.* Southwick & Beg, 1961, p. 391; Southwick, 1962, p. 438; Southwick et al., 1965, pp. 137, 142. *6.* Lindburg, 1971, p. 37; 1977b, p. 241; Makwana, 1979b, p. 920. *7.* Mukherjee, 1969, p. 49. *8.* Lindburg, 1969, p. 1177; 1971, p. 38. *9.* Neville, 1968b, p. 118; 1968c, p. 15. *10.* Jay, 1963, p. 278. *11.* Mandal, 1964, p. 161. *12.* Qu et al., 1993, p. 616. *13.* Altmann, 1962, p. 371; Boelkins & Wilson, 1972, p. 130; Hausfater, 1972, p. 81; Sade et al., 1977, p. 260; Lauer, 1980, p. 477. *14.* Marsden, 1968, p. 241; 1973, p. 248; Vessey, 1968, p. 230; Drickamer, 1975, p. 28. *15.* Judge & de Waal, 1994, p. 65.

[2] Includes one mixed rhesus-langur group.

10 to 150 m from one another, peacefully feeding on the ground (Mukherjee, 1977, p. 111; 1982, p. 75). In Bangladesh, *M. mulatta M.* and *nemestrina* are listed as sympatric at five localities (Feeroz et al., 1995, p. 76).

M. mulatta and *M. radiata* have been reported in mixed-species groups in peninsular India at three close-lying localities near the 1,000-km-long boundary between the geographic ranges of these two species (Fooden et al., 1981, p. 465; Koyama & Shekar, 1981, p. 248). One of these mixed-species groups included one *M. mulatta* female and three *M. radiata* males; these four monkeys were ca. 50 m from a larger group of *M. mulatta*. Another mixed group included at least 22 *M. mulatta* individuals and one *M. radiata* male; two additional unseen *M. radiata* individuals reportedly were also associated with this group. The third mixed group included 18 *M. mulatta* individuals and one *M. radiata* male. At another nearby locality, a group of 20 *M. mulatta* individuals remained within 10 to 50 m of a group of 22 *M. radiata* individuals for ca. 45 min (Fooden et al., 1981, p. 472); neither mixing nor overt interaction occurred between these two groups.

The boundary between the geographic ranges of *M. mulatta* and *M. fascicularis* extends approximately 2,000 km across the Indochinese peninsula. Although direct contact between these two species has not been reported, a few morphologically intermediate specimens have been collected near the interspecific boundary (Fooden, 1997, fig. 3). This probably indicates that limited hybridization has occurred between *M. mulatta* and *M. fascicularis*. Hybridization between *M. mulatta* and *M. fascicularis* has been reported in mixed-species groups in Xianggang (= Hong Kong) that are the result of human introduction (Southwick & Southwick, 1983, p. 19; Southwick & Manry, 1987, p. 48; Burton & Chan, 1996, p. 395).

In summary, divergent habitat preferences apparently limit contact between *M. mulatta* and *M. assamensis*, *M. thibetana*, *M. arctoides*, and *M. nemestrina*. In marginal habitats, *M. mulatta* may encounter these four species; such contacts apparently are not hostile, and they may result in the formation of mixed groups. The habitat preferences of *M. mulatta* are similar to those of *M. radiata* and *M. fascicularis*. Along the boundary between the geographic ranges of *M. mulatta* and *M. radiata*, nonhostile interspecific contact and mixed-species groups have been observed; along the boundary between the ranges of *M. mulatta* and *M. fascicularis*, morphological evidence indicates the occurrence of occasional hybridization.

INTERGENERIC—In northern and peninsular India, the geographic range of *M. mulatta* broadly overlaps that of the Hanuman langur, *Semnopithecus entellus*, and frequent contacts between these two species have been observed. In antagonistic encounters, *M. mulatta* usually is more aggressive and displaces *S. entellus* (Makwana, 1979b, p. 920; Pirta, 1984, pp. 274–279; Lindburg, 1971, p. 43; Ross et al., 1993, p. 162; Mathur, 1996, p. 360); however, at one locality groups of each species defended territories against incursion by the other species (Mathur, 1982, p. 12), and at another locality a male *S. entellus* successfully drove off a male *M. mulatta* (Neville, 1968c, p. 16). Peaceful encounters that have been reported include groups of *M. mulatta* and *S. entellus* feeding together in the same tree and in the same cultivated field (Oboussier & von Maydell, 1960, p. 144; Jay, 1965, p. 212; Lindburg, 1971, p. 43; Prater, 1980, p. 37; Mathur, 1982, p. 12) and interspecific play by infants and juveniles (Manohar & Mathur, 1992, p. 114). Mixed-species groups also have been reported; these usually are composed of one or two *M. mulatta* individuals in a group of *S. entellus* (Jay, 1963, p. 274; 1965, pp. 200, 212, 249; Roonwal & Mohnot, 1977, p. 264; Singh & Sen, 1977–78, p. 136; Mathur & Lobo, 1990, p. 308); in at least two of these groups, the *M. mulatta* individuals were dominant to the *S. entellus* individuals (Jay, 1963, p. 274; Roonwal & Mohnot, 1977, p. 264). In a mixed-species group that included 40 *S. entellus* individuals and eight *M. mulatta* individuals, an adult female *S. entellus* nursed an infant *M. mulatta*, and a young male *S. entellus* carried an infant *M. mulatta* on his back (Das & Sharma, 1981, p. 496).

In northeastern India, *M. mulatta* is sympatric with the golden langur, *Trachypithecus geei*. Interspecific behavior between these monkeys apparently is variable, as they have been reported to maintain distance from one another (Khajuria, 1962b, p. 128); to casually encounter one another peacefully (Mukherjee & Saha, 1974, p. 337); to feed in close proximity, but with *M. mulatta* on the ground and *T. geei* in the branches overhead (Mukherjee, 1978b, p. 741); to feed together harmoniously in favored food trees (Oboussier & von Maydell, 1959, p. 106); and, in two instances, to contest for possession of a feeding site, with *M. mulatta* prevailing on both occasions (Mukherjee, 1978b, p. 742).

In Madhupur National Park, Bangladesh, *M. mulatta* reportedly coexists peacefully with the capped langur, *Trachypithecus pileatus* (Islam & Husain, 1982, p. 157; cf. Gittins & Akonda, 1982, p. 278). At this locality, *M. mulatta* generally is observed lower in the trees than *T. pileatus*.

A commensal relationship between *M. mulatta* and two species of deer, *Axis axis* and *Muntiacus muntjak*, has frequently been reported in India (Champion, 1927, p. 201; de Poncins, 1935, p. 846; Khajuria, 1962a, p. 122; Mandal, 1964, p. 157; Mukherjee & Gupta, 1965, p. 146; Hendrichs, 1975, p. 171, Sanyal, 1983, p. 3; cf. Lindburg, 1971, p. 42). The deer move in close association with *M. mulatta* and feed on fruits, leaves, and twigs dislodged by activity of the monkeys in branches overhead. The deer apparently also exploit the monkeys' alarm calls to avoid approaching predators (Mukherjee & Gupta, 1965, p. 146; Sanyal, 1983, p. 3). One observer reports that *M. mulatta* sometimes leaps down from branches and rides on the back of deer (Mandal, 1964, p. 158).

In northern India, *M. mulatta* individuals were observed to chase a jackal, *Canis aureus*, and frequently to chase away crows, *Corvus* sp., that were competing for provisioned food (Lindburg, 1971, p. 43).

Reproduction

Seasonality

Matings and births are strongly seasonal in natural populations of *M. mulatta* (Table 22). At localities widely dispersed across the geographic range of this species, reported matings consistently peak in the fall and winter, and births peak in the spring and summer. At four sample areas in India, a second, minor birth peak in the fall

TABLE 22. Mating and birth periods reported for natural populations of *Macaca mulatta*.

Sample area	Approximate latitude (N)	Mating period	References[1]	Birth period	References[1]
Afghanistan	35°	(No data)	—	Apr.–Nov.	*1*
Pakistan	34°	Aug.–Nov.	*2, 3*	Mar.–May	*2, 4*
India					
Himachal Pradesh	31°	Aug.–Nov.	*5, 6*	Mar.–May[2]	*5*
Delhi	28°	Sept.–Feb.	*7*	Mar.–July (major) Oct. (minor)	*8*
Rajasthan	27°	Oct.	*9*	Mar.–July (major) Sept.–Oct. (minor)	*9, 10*
Uttar Pradesh	29°	Sept.–Feb.[3]	*11, 12*	Mar.–July (major) Sept. (minor)	*11, 13*
Calcutta	23°	Dec.	*14*	(No data)	—
Sundarbans	22°	(No data)	—	Apr.–May (major) Sept.–Oct. (minor)	*15*
Nepal	28°	Oct.–Feb.	*16*	Apr.–Aug.	*16, 17*
Vietnam	20°	(No data)	—	Summer, primarily[4]	*18*
China					
Hainan	18°	Nov.–Mar.	*19*	Apr.–Aug.	*19*
Xianggang (= Hong Kong)[5]	22°	(No data)	—	June–July, peak[6]	*20*
Guangxi	23°	Nov.–Jan.	*21*	Apr.–Aug.	*21*
Yunnan[7]	22°	Sept.–Jan.	*22*	Mar.–June	*22*
Hubei	31°	?Jan.–Mar.[8]	*23*	July–Aug., peak	*23, 24*
Henan	35°	Sept.–Nov.	*25*	Mar.–May	*25*

[1] Key to references: *1.* Puget, 1971, p. 200. *2.* Hingston, [1920], p. 245; Pearl et al., 1987, p. 36. *3.* Igbal & Rub, 1980, p. 214; Rab et al., 1991, p. 221. *4.* Roberts, 1977, p. 87. *5.* Dodsworth, 1914, p. 730. *6.* Heape, 1894, p. 414. *7.* Malik & Johnson, 1992, pp. 26–27. *8.* Malik et al., 1984, p. 314; Johnson et al., 1993, p. 68. *9.* Wolfe & Mathur, 1988, p. 538. *10.* Prakash, 1962, p. 85; Ojha, 1983, p. 75; Singh, 1989, p. 140; Mathur, 1994, p. 132. *11.* Neville, 1968a, p. 772; 1968c, p. 15. *12.* Southwick et al., 1965, p. 151; Siddiqi & Southwick, 1980, p. 54; Lindburg, 1969, p. 1177; 1983, p. 46. *13.* Heape, 1897, p. 137; Nolte, 1956, p. 181; Southwick et al., 1961b, p. 705; Mukherjee, 1969, p. 54; Lindburg, 1971, p. 77; Pirta & Singh, 1981, p. 342; Strum & Southwick, 1986, p. 953. *14.* Saha, 1974, p. 211. *15.* Mandal, 1964, p. 159. *16.* Teas, 1984, p. 242. *17.* Marriott, 1988, p. 129. *18.* Dang, 1983, p. 1283. *19.* Jiang et al., 1988a, pp. 106–107. *20.* Burton & Chan, 1996, p. 402. *21.* Wang et al., 1996, pp. 267–268, 271. *22.* Editors, 1989, p. 144. *23.* Poirier, 1985, p. 298. *24.* Poirier & Hu, 1983, p. 387. *25.* Qu et al., 1993, p. 614.

[2] Excludes questionable report: Aug.–Sept. (J. E. T. Aitchison in Heape, 1894, p. 414; 1897, p. 137).

[3] Excludes rare matings observed in April (Southwick et al., 1965, p. 151; Lindburg, 1983, p. 46).

[4] Some neonates reportedly were also observed in other seasons.

[5] Population probably introduced (Herklots, 1951, p. 83); possibly includes some interspecific hybrids.

[6] "[B]irths range from mid-winter to early autumn."

[7] Data probably were derived mainly from a captive population; also see Zeng et al., 1983, p. 155.

[8] Inferred from unspecified evidence.

also has been reported; this presumably implies an unreported minor mating peak in the spring. The occurrence of a minor birth peak in the fall may account for the somewhat protracted birth seasons that have been reported in Afghanistan and Vietnam. There is no evidence that births in natural populations living at higher latitudes occur later than in those living at lower latitudes (Table 22), as previously suggested by data derived primarily from translocated captive populations (Van Horn, 1980, p. 192; cf. Lindburg, 1987, p. 197). In captive groups of *M. mulatta* housed outdoors in the northern hemisphere, reproductive seasonality is generally similar to that in natural populations (Harrison, 1980, p. 271; Van Horn, 1980, p. 183; Curie-Cohen et al., 1983, p. 129; Goo & Fugate, 1984, p. 67; Small & Smith, 1986, p. 293; Taub & Mehlman, 1989, p. 164; Bercovitch, 1992, p. 275; Ouyang & Ma, 1992, p. 14; Lehman et al., 1994, p. 120; Johnson & Kapsalis, 1995b, p. 272); captives in the southern hemisphere exhibit reversed cycles, generally mating in March–August and giving birth in September–February, in accord with southern hemisphere seasons (Hartman, 1931, p. 135; Strahan et al., 1973, p. 385; Coimbra-Filho & Maia, 1977, p. 75; Bielert & Vandenbergh, 1981, p. 231; de Faaria & Guerra, 1985, p. 187). Captives housed indoors tend to

TABLE 23. Age of sexual maturity reported for natural populations of *Macaca mulatta*.

Sample area	Approximate latitude (N)	Provisioned	Adolescent sample size	Estimated age (yr) at first fertile copulation[1]		References[2]
				Youngest age	Typical age	
Females						
Pakistan, N	34°	No	6	4.5	5.5	*1*
India: Delhi	28°	Yes	13	2.5	3.5	*2*
Vietnam	20°	?	?	(1.5, puberty)	—	*3*
China: Hainan	18°	Yes	?	3.5	4.5	*4*
China: Henan	35°	Yes	<24	4.5[3]	5.5[3]	*5*
Males						
Pakistan, N	34°	No	?	—	6.5	*1*
Vietnam	20°	?	?	—	>1.5	*3*
China: Henan	35°	Yes	<24	4.5[4]	6.5[4]	*5*

[1] During the mating season, all individuals are approximately midway between their birth anniversaries.
[2] Key to references: *1*. Melnick et al., 1984, p. 230. *2*. Malik & Johnson, 1992, p. 27. *3*. Dang, 1983, p. 1283. *4*. Jiang et al., 1988a, p. 112; 1991, p. 211. *5*. Qu et al., 1993, p. 614.
[3] Reported as 4 to 5 years.
[4] Reported as 4.5 to 6 years.

lose reproductive seasonality (Valerio et al., 1969a, p. 66; Michael & Zumpe, 1976, p. 308; Herndon et al., 1985, p. 735).

Sexual Maturation

In natural populations, females may become sexually mature (i.e., capable of engaging in fertile copulations) as early as age 2.5 years (Table 23); more commonly, however, female sexual maturity is not achieved until age 3.5 to 5.5 years. Males in natural populations apparently become sexually mature later than females, perhaps usually at age 6.5 years. In captive colonies, most females become sexually mature at age 3.5 years (Vandenbergh, 1973, p. 7; Rawlins & Kessler, 1986c, p. 52; Ouyang & Ma, 1992, p. 14; Bercovitch & Berard, 1993, p. 105); reproductive capability in captive females probably requires a minimum body weight of ca. 4 kg (Bercovitch et al., 1998, p. 137). Although captive males are capable of fertilizing females at age 3.5 years (Catchpole & van Wagenen, 1975, p. 133; Stern & Smith, 1984, p. 24; Bernstein et al., 1991, p. 33), males in the free-ranging Cayo Santiago colony usually do not participate in breeding activity before age 4.5 or 5.5 years (Conaway & Koford, 1964, p. 586; Sade, 1968, p. 25; cf. Ouyang & Ma, 1992, p. 14). In captivity, sexual maturation is influenced by diet, housing, group density, and social rank (Zimmermann et al., 1975, p. 298; Wilen & Naftolin, 1976, p. 358; Schwartz et al., 1988, p. 240; Wilson et al., 1988, p. 2655; Bercovitch & Berard, 1993, p. 105; Mann et al., 1998, p. 497).

In 59 captive females, the first menstrual bleeding (menarche) preceded sexual maturity by ca. 1 year (Bercovitch & Goy, 1990, p. 64). The mean age at menarche in this group was 29.8 ± 0.6 months (SEM; extremes, 20.1–42.4 months); in another colony, the mean age at menarche was 9 months less (20.6 months, n = 25; extremes, 13.9–25.3 months) (van Wagenen, 1972, p. 25).

In males, the testes usually are scrotal at birth (Wislocki, 1933a, p. 134; 1933b, p. 234). Within a few months they ascend to the inguinal region and remain there until age 3 to 4 years, when they return to the scrotum (Schultz, 1933, p. 26; Sade, 1964, p. 175; Goy et al., 1982, p. 288). During the next year or two, the testes may temporarily reascend to the inguinal region, but about age 5.5 years they become permanently scrotal. At or before the age of permanent testis descent, males generally emigrate from their natal group, usually near the beginning of a mating season (Koford, 1966, p. 5; Sade, 1968, p. 26; Missakian, 1973a, p. 228; Drickamer & Vessey, 1974, p. 361; Sade et al., 1977, p. 256; Colvin, 1983, p. 161; Jiang et al., 1988a, p. 110; Kaplan et al., 1995, p. 231). Subsequently, males also generally emigrate again as adults (Lindburg, 1969, p. 1177); in one captive free-ranging colony, the average group tenure of postjuvenile males was ca. 2 years (Vessey & Meikle, 1987, p. 289). Females apparently rarely emigrate from their natal group; in one captive free-ranging colony, fewer than 3% of females

emigrated during a 3-year observation period (Koford, 1966, p. 6).

Sexual Skin

In postjuvenile females and males, regions of the skin undergo intermittent swelling and/or reddening (Darwin, 1871, p. 279; 1876, p. 19; Anderson, 1879, p. 58; Langley & Sherrington, 1891, p. 284; Heape, 1896, p. 202; 1897, p. 139; Corner, 1923, p. 82; Allen, 1926, p. 226; 1927, p. 9; Collings, 1926, p. 272; Zuckerman, 1930, p. 702; Stewart, 1933, p. 29). In captive females, the earliest manifestation of this "sexual skin" (Langley & Sherrington, 1891, p. 290) is the development during the second or third year of life of a pair of pinkish pubic swellings (Hartman, 1928c, p. 182; 1932, p. 20; Zuckerman et al., 1938, p. 385; van Wagenen, 1950, p. 26; Eckstein & Zuckerman, 1956, p. 139; Hadidian & Bernstein, 1979, p. 436); the location of these swellings is similar to that of the scrotum in a male. After approximately 2 weeks, these pubic swellings subside and the first menstrual bleeding occurs. Within the next few months, the fully developed sexual skin of puberty appears; this consists of a large bilobed blister-like pubic swelling, from which a less prominent edematous midline swelling extends posteriorly as far as the sides of the vulva. During the subsequent menstrual cycles of adolescence, a period that may extend up to 2 years, the sexual skin of puberty is gradually transformed, becoming less acutely swollen, redder, and more extensive; the cyclically edematous area of sexual skin often extends beyond the vulva and anus to the root of the tail, over the buttock area and posterior surface of the thighs, and over the iliac region. In sexually mature females (beginning at age ca. 3.5–5.5 years), the primary cyclical manifestation of sexual skin is reddening rather than swelling; in addition to the buttocks and adjacent regions, the areas of redness frequently include the face and nipples. During the menstrual cycle, the red color of the sexual skin generally reaches maximum intensity near the day of ovulation (Anonymous, 1973, p. 9; Czaja & Bielert, 1975, p. 587; Czaja et al., 1975, p. 1681; cf. Zuckerman, 1930, p. 728; Zuckerman et al., 1938, p. 389; Carpenter, 1942a, p. 131); this cyclic variation apparently may be diminished in older females (Hartman, 1932, p. 21; Stewart, 1933, p. 29; Valerio et al., 1969b, p. 284). Sexual skin color reportedly is brighter during the mating season than during the nonmating season (Gordon & Bernstein, 1973, p. 223; Baulu, 1976, p. 487; Rab et al., 1991, p. 221; cf. McCann, 1933b, p. 810). The bright red color of the sexual skin is retained during pregnancy and frequently during lactation (Heape, 1894, p. 456; 1897, p. 140; Hartman, 1928b, p. 539; 1928c, p. 187; 1932, p. 21; Tinklepaugh & Hartman, 1930, p. 66; Bielert et al., 1976, p. 182).

In pubertal and adolescent males, red sexual skin develops in approximately the same posterior and facial regions as in females, but there is no pubertal swelling of the sexual skin in males (Zuckerman, 1937, p. 327). As in females, the red color in males is brighter during the mating season than during the nonmating season (Sade, 1964, p. 179; Koford, 1965, p. 165; Lindburg, 1971, p. 91; 1983, p. 47; Gordon & Bernstein, 1973, p. 223; Baulu, 1976, p. 485; Bielert & Vandenbergh, 1981, p. 231; Rab et al., 1991, p. 221). Subcutaneous fat deposits also vary seasonally in sexually mature males, increasing prior to the mating season and decreasing during the mating season (Lindburg, 1977b, p. 247; Bernstein et al., 1989, p. 253; Bercovitch, 1992, p. 277; Zeng, 1992, p. 22; Bercovitch & Nürnberg, 1996, p. 63).

Menstrual Cycle

In three studies of 4,626 menstrual cycles (ca. 600 females), modal cycle lengths were 27, 28, and 28/30 (bimodal) days (Valerio et al., 1969b, p. 286; Anand Kumar et al., 1980, p. 38; Dailey & Neill, 1981, p. 562); extreme cycle lengths were 6 and 237 days, but few cycles were longer than 50 days, and longer cycles (?anovulatory periods) generally occurred during the summer season of infrequent matings. The modal durations of menstrual flow reported in two of these studies were 3 and 4 days (3,370 cycles, 490 females); extreme durations in both studies were 1 and 11 days, and mean durations were 3.5 and 3.9 days.

Estrus

During the mating season, female sexual activity (estrus) is cyclical in natural and seminatural groups of *M. mulatta* (Carpenter, 1942a, p. 117; Conaway & Koford, 1964, p. 584; Kaufmann, 1965, p. 501; Loy, 1971, p. 2; Lindburg, 1971, p. 94). Within groups, the estrous periods of individual females are asynchronous, and male sexual activity apparently is not cyclical. In five studies

of ca. 160 females, length of the estrous period averaged 8 to 12 days (Wilson & Gordon, 1980, p. 639; Lindburg, 1983, p. 50; Berman et al., 1993, p. 393; cf. Loy, 1970, p. 287), and length of the intervening period of sexual inactivity averaged 19 to 22 days (not reported in two studies). The midpoint of a female's estrous period approximately coincides with her day of ovulation (ca. 11–14 days after onset of previous menstruation), which is the day on which she generally participates in the maximum number of ejaculatory copulations (Ball & Hartman, 1935, p. 118; Michael, 1965, p. 596; Valerio et al., 1969b, p. 292; Wallen, 1990, p. 236; Michael & Zumpe, 1993, p. 226). During three years of observation, 34 to 40 females in a seminatural group averaged 2.2 estrous periods per mating season (extremes, 0–5 periods per season) (Kaufmann, 1965, p. 504), and a similar frequency of estrous periods per season was observed during a 10-month study of 35 females in a natural population (Lindburg, 1971, p. 95). In two groups, 63% and 77% of the females apparently were impregnated during their first estrous periods of the mating season (Conaway & Koford, 1964, p. 585; Lindburg, 1971, p. 95); most of these females apparently also had subsequent postconception estrous periods during the same mating season (cf. Altmann, 1962, p. 389; Lindburg, 1983, p. 50). In captive females, estrous cycles may be attenuated (Tinklepaugh, 1933, p. 336; Rowell, 1963, p.198; Kuehn & Young, 1965, p. 688; Johnson & Phoenix, 1978, p. 167; Keverne, 1981, p. 119).

Consortship

In natural and seminatural groups, temporary copulatory associations (consortships) are formed between estrous females and their male partners (Carpenter, 1942a, p. 118; Altmann, 1962, p. 393; Kaufmann, 1965, p. 502; Southwick et al., 1965, p. 151; Vandenbergh & Vessey, 1968, p. 73; Lindburg, 1971, p. 91; Brereton, 1981, p. 419; Hill, 1987, p. 443; Rab et al., 1991, p. 222; Berard et al., 1993, p. 483; cf. Manson, 1996b, p. 156; 1997, p. 353). The duration of these consortships reportedly varies from ≤25 minutes to 11 days; a duration of 1 to 2 days probably is typical (Southwick et al., 1965, p. 152; Hill, 1987, p. 446). A female usually consorts with more than one male during each of her estrous periods; in a natural group, females changed consort partners in 24 of 38 estrous periods observed (Lindburg, 1971, p. 94; cf. Carpenter, 1942a, p. 138). Over the course of one mating season, one female was observed to consort with 11 of 12 group males, and one male was observed to consort with 18 of 34 group females (Conaway & Koford, 1964, p. 582); during a single day, a female may consort with more than one male, and a male may consort with more than one female (Southwick et al., 1965, p. 152; Vandenbergh & Vessey, 1968, p. 73). Although either sex may initiate a consort relationship (Kaufmann, 1965, p. 502; Lindburg, 1971, p. 92; 1983, p. 54; Rab et al., 1991, p. 222), in one study of 53 consortships, male partners were responsible for maintaining proximity approximately twice as frequently as females (Hill, 1987, p. 446). The consortships of high-ranking individuals usually are conducted near the center of their group; those of low-ranking individuals may be conducted several hundred meters from other group members (Lindburg, 1971, p. 92; Rab et al., 1991, p. 222). In a seminatural population, females occasionally have been observed to move temporarily into another group and to form a consortship there (Carpenter, 1942b, p. 154; Brereton, 1981, p. 419).

Copulatory Behavior

Copulations, like consortships, may be initiated by either sex (Hinde & Rowell, 1962, p. 16; Harlow, 1965, p. 235); in laboratory pair tests with multiple copulations, the frequency of female initiations in second copulations (ca. 35%) tends to exceed that in first copulations (ca. 15%) (Michael & Zumpe, 1970, p. 176; Dixson et al., 1973, p. 42). Near the beginning of a copulation, the female typically presents by turning her perineal region toward the male, and the male mounts dorsoventrally by grasping the female's waist and shanks with his hands and feet, respectively (Carpenter, 1942a, p. 132; Altmann, 1962, p. 374; Southwick et al., 1965, p. 152). Although ejaculation in *M. mulatta* occasionally is accomplished in a single mount (Kaufmann, 1965, p. 502; Michael et al., 1973, p. 249; Shively et al., 1982, p. 376; Curie-Cohen et al., 1983, p. 129; Manson, 1996a, p. 1225), usually a series of mounts, separated by dismounts, is required to complete a copulation. Each mount includes one to 15 intromissive thrusts and usually lasts less than 1 min (Prakash, 1962, p. 84; Southwick et al., 1965, p. 152; Michael & Saayman, 1967b, p. 462; Shively et al., 1982, p. 376; Lindburg, 1983, p. 51). A

copulation may include as many as ca. 100 mounts and dismounts (Carpenter, 1942a, p. 133) and may last up to 30 min or, rarely, 1 hr (Prakash, 1962, p. 84; Kaufmann, 1965, p. 502; Southwick et al., 1965, p. 152; Lindburg, 1971, p. 94; Manson, 1996a, p. 1223); in laboratory pair tests with multiple copulations, the number of mounts per copulation and the duration of copulations tend to increase in successive copulations (Kuehn & Young, 1965, p. 688; Michael & Saayman, 1967b, p. 463; Missakian et al., 1969, p. 234). The copulation rate of estrous females in a seminatural group has been estimated to be ca. 0.4/hr (Manson, 1992, p. 412). In caged animals, the rate of copulatory behaviors apparently is greater at 0900 than at 2100 (Chambers et al., 1982, p. 38), and copulation rarely occurs late at night (Erffmeyer, 1982, p. 246). Following copulation, coagulated semen often is visible on the perineum of the female ("vaginal plug," Hartman, 1932, p. 39; cf. Carpenter, 1942a, p. 119; Altmann, 1962, p. 375; Mastroianni & Manson, 1963, p. 1026; Vandenbergh & Vessey, 1968, p. 73; Blandau, 1973, p. 295; Lindburg, 1983, p. 47).

Dominance Rank and Reproductive Success

The relationship between male copulation frequency, fertilization success, and dominance rank in *M. mulatta* has been studied in natural groups, free-ranging seminatural groups, and compound-housed groups (cf. Bercovitch, 1997, p. 248). Evidence from natural groups suggests that male copulation frequency and fertilization success are positively correlated with dominance rank, and evidence from seminatural and compound-housed groups equivocally tends in the same direction (cf. Paul, 1997, p. 345; Bercovitch & Nürnberg, 1997, p. 1703; Rifkin et al., 1999, p. 93). Field studies at two localities in India and one locality in Pakistan indicate that a male's copulation frequency and number of female partners are correlated with his dominance rank (Southwick et al., 1965, p. 152; Igbal & Rub, 1980, p. 214; Lindburg, 1983, p. 52; Rab et al., 1991, p. 222); preliminary analysis of blood protein data from two groups at the Pakistan locality suggests that most of the infants born during three years were fathered by the alpha male of each group (Melnick & Hoelzer, 1996, p. 430). Although most studies of the seminatural Cayo Santiago population similarly indicate that male copulation frequency is positively correlated with dominance rank (Carpenter, 1942b, p. 156; Koford, 1963, p. 150; Conaway & Koford, 1964, p. 582; Kaufmann, 1965, p. 507; Sade, 1980, p. 182; McMillan, 1982b, p. 312; Chapais, 1983, p. 219; Hill, 1987, p. 445; Manson, 1992, p. 412; 1996a, p. 1223; Berard et al., 1993, p. 485), a few studies of this population have failed to find such a correlation (Loy, 1971, p. 8; McMillan, 1982a, p. 207; Berard, 1993, p. 298; 1999, p. 163); factors that may tend to bias these observations are the relatively low visibility of low-ranking males (Drickamer, 1974a, p. 119) and the relatively low mating success of low-ranking subadult males (McMillan, 1982a, p. 207). Available results of genetic paternity tests in the Cayo Santiago population are inconclusive concerning a correlation between fertilization success and dominance rank (Sade, 1980, p. 182; Berard et al., 1993, p. 484; 1994, p. 184; Berard & Schmidtke, 1996, abstract no. 459). Male reproductive success in the Cayo Santiago population may be affected by the abnormally large group size in this provisioned population and the high ratio of sexually mature males to sexually mature females (Tables 14,15; Manson, 1992, pp. 407, 414). Most, but not all, evidence from studies of compound-housed groups suggests that copulation frequency may be correlated with dominance rank (Gordon et al., 1976, p. 239; Ruiz de Elvira et al., 1982, p. 829; Shively, 1982, p. 377; Wilson et al., 1982, p. 24; Curie-Cohen et al., 1983, p. 130; Stern & Smith, 1984, p. 29; Jebavý et al., 1994, p. 202; Bercovitch & Nürnberg, 1996, p. 61) and that fertilization success also may be correlated with dominance rank (Duvall et al., 1976, p. 29; Smith, 1980, p. 248; 1981, p. 87; 1993, p. 474; 1994b, p. 234; Berenstain et al., 1981, p. 1058; Curie-Cohen et al., 1983, p. 133; Stern & Smith, 1984, p. 27; Smith & Smith, 1988, p. 557; Bercovitch & Nürnberg, 1996, p. 61; Bercovitch, 1997, p. 248). In seminatural and compound-housed groups, dominant males and females often harass and disrupt the copulations of subordinate group members (Herndon et al., 1986, p. 95; Manson, 1994, p. 136; 1996a, p. 1224).

Inbreeding

Blood-protein evidence from five groups in Pakistan indicates that close inbreeding is rare in natural populations of *M. mulatta* (Melnick et al., 1984, p. 235); the opportunity for such inbreeding is obviously limited by the tendency for pubertal males to emigrate from their natal groups (see

above). In the Cayo Santiago free-ranging population, relatively few mother-son and brother-sister copulations have been observed (Kaufmann, 1965, p. 508; Sade, 1968, pp. 18, 33, 36; 1972, p. 392; Loy, 1971, p. 12; Missakian, 1973a, p. 230; Sade et al., 1984, p. 213; Manson & Perry, 1993, p. 340; Berard & Schmidtke, 1996, abstract no. 459), and the same is true of the Yerkes compound-housed population (Wilson, 1981, p. 475). Genetic paternity tests of compound-housed groups at Davis, California, indicate that matrilineal inbreeding is rare (two of 132 infants) but that patrilineal inbreeding, except for father-daughter mating, is common (Smith, 1982, p. 448; 1986a, p. 219; 1986b, p. 864; 1995, p. 34).

Nonreproductive Sexual Behavior

Sexual behavior in *M. mulatta* may serve nonreproductive functions (Carpenter, 1942a, p. 132). Male and female homosexual mounting has been observed in natural, seminatural, compound-housed, and caged groups (Kempf, 1917, p. 134; Carpenter, 1942b, p. 150; Altmann, 1962, p. 383; Gordon & Bernstein, 1973, p. 224; Gordon et al., 1978, p. 626; Akers & Conaway, 1979, p. 66; Igbal & Rub, 1980, p. 214; Loy & Loy, 1982, p. 308). Mounting of males by females also has been observed in seminatural and caged groups (Carpenter, 1942b, p. 152; Altmann, 1962, p. 383; Freedman & Rosvold, 1962, p. 26; Michael et al., 1974, p. 401). Male masturbation has been reported in natural groups (Prakash, 1962, p. 85; Lindburg, 1973, p. 146; Igbal & Rub, 1980, p. 214) and in seminatural groups, compound-housed groups, and caged individuals (Carpenter, 1942b, p. 152; Altmann, 1962, p. 375; Rowell, 1963, p. 196; Michael & Saayman, 1967a, p. 217).

Gestation Length

In a large laboratory colony of *M. mulatta*, the mean (±SD) gestation length was 165.4 ± 6.1 days for 1,067 viable female births and 166.2 ± 6.7 days for 1,115 viable male births (Shaughnessy et al., 1978, p. 132; cf. Hartman, 1928a, p. 15); in two other large colonies, mean gestation length was 166.5 days (n = 709; Silk et al., 1993, p. 97) and 168.4 days (n = 311; van Wagenen, 1972, p. 9). Reported minimum and maximum lengths of viable pregnancies are 133 days and 200 days (Silk et al., 1993, p. 97). Gestation length averages greater in young primaparous mothers (ca. 169 days) than in old multiparous mothers (ca. 162 days) (Hartman, 1932, p. 53; Silk et al., 1993, p. 98). In an experimental study of nutritional effects, gestation length was ca. 8.5 days less in pregnant females fed a high-protein diet than in those fed a low-protein diet (Riopelle & Hale, 1975, p. 1173); this suggests that gestation length in unprovisioned natural populations may be greater than gestation length in provisioned captive populations.

Parturition

Parturition is rarely observed in natural populations of *M. mulatta*, even in those that have been closely studied (Southwick et al., 1965, p. 155; Lindburg, 1971, p. 77; Teas et al., 1981b, p. 580; Mathur, 1994, p. 132). Most newborn infants in closely studied natural populations are first seen early in the morning, which presumably implies that births usually occur at night. Of the five births and one stillbirth that have been partially or completely observed during daylight hours (early morning to late afternoon), all apparently occurred while the mother was on the ground—in undergrowth in at least three cases (Lindburg, 1971, p. 77; Teas et al., 1981b, p. 581; Mathur, 1994, p. 132). From the first observed contraction to delivery of the afterbirth, the approximate duration of three of the live births was 15 min, 1 hr, and 0.5 to 2.5 hr. The placenta was eaten by at least two of the five mothers. Observed births in captive populations apparently are generally similar to those in natural populations with respect to timing, duration, and consumption of the placenta (Pocock, 1906, p. 562; Hartman, 1932, p. 52; Hinde et al., 1964, p. 613; Valerio et al., 1969a, p. 72; Brandt & Mitchell, 1971, p. 199; Shaughnessy et al., 1978, p. 130; Rawlins, 1979, p. 432; Adachi et al., 1982, p. 585; Gibber, 1986, p. 121).

The frequency of stillbirths was 5.5% (259 stillbirths/4,711 births) in four large captive colonies (Shaughnessy et al., 1978, p. 130; Scanlan et al., 1985, p. 363; Rawlins & Kessler, 1986c, p. 52; Small & Smith, 1986, p. 293). The frequency of twinning was 0.23% (13 twin pairs/5,561 live births) in three large captive colonies (Geissmann, 1990, p. 392; cf. Chalise & Ghimire, 1998, p. 11).

TABLE 24. Birth weight (g) in laboratory-housed *Macaca mulatta*.

Laboratory[1]	Female infants		Male infants		Pregnancy information	References[2]
	Mean ± SD	N	Mean ± SD	N		
DOGYU	457.7	161	479.1	150	—	*1*
China[3]	430 ± 56.4	40	460 ± 58.8	40	—	*2*
CRPRC	470.4 ± 70.0	356	485.5 ± 72.0	353	—	*3*
LBI	476.0 ± 76.1	1,067	502.8 ± 73.4	1,115	—	*4*
LBI	474 ± 74	~250	504 ± 23	~250	Bred in laboratory	*5*
LBI	402 ± 87	~250	440 ± 69	~250	Received pregnant	*5*
LPP	461.5 ± 82.6	116	484.1 ± 76.3	119	—	*4*
NLAC	414.6 ± 12.7	11	416.4 ± 17.5	7	—	*6*
WRPRC	464 ± 63	255	498 ± 66	255	—	*7*

[1] DOGYU = Department of Obstetrics and Gynecology, Yale University School of Medicine, New Haven, CT; CRPRC = California Regional Primate Research Center, University of California, Davis, CA; LBI = Litton Bionetics, Inc., Kensington, MD; LPP = Laboratory of Perinatal Physiology, National Institute of Neurological Diseases and Stroke, San Juan, PR; NLAC = National Laboratory Animal Centre, Central Drug Research Institute, Lucknow, India; WRPRC = Wisconsin Regional Primate Research Center, Madison, WI.

[2] Key to references: *1.* van Wagenen, 1972, p. 9. *2.* Zeng, 1992, p. 18. *3.* Silk et al., 1993, p. 98. *4.* Shaughnessy et al., 1978, p. 131. *5.* Valerio et al., 1969a, pp. 48, 67. *6.* Maity & Rathore, 1998, p. 247. *7.* Kemnitz, 1994, p. 220.

[3] Laboratory unspecified.

Birth Weight, Infant Sex Ratio

Birth weight in one large laboratory colony averaged 476.0 g in 1,067 female infants and 502.8 g in 1,115 male infants (Table 24); in five other large colonies, birth weight averaged somewhat less. The birth weight of inbred infants averages less than that of non-inbred infants (Smith, 1986b, p. 869). Judging from the relatively low weight of infants born to females that were pregnant when imported (Table 24), birth weight in natural populations may be less than in laboratory colonies.

The male/female infant sex ratio was 1.16 in three natural populations of *M. mulatta* (n = 212 sexed infants) and 1.03 in 10 captive populations (n = 7,445 sexed infants) (Table 25; cf. Debyser, 1995, p. 955); neither of these ratios differs significantly from 1.00 ($P > 0.10$). The possibility that infant sex ratio in this species may be influenced by maternal dominance rank has been investigated with equivocal results in four captive colonies. In two compound-housed colonies, high-ranking females tended to have female-biased infant sex ratios (Simpson & Simpson, 1982, p. 440; 1985, p. 85; Small & Smith, 1985, p. 356; Small & Hrdy, 1986, p. 362; Gomendio, 1990, p. 369; Nevison et al., 1996, p. 127; Nevison, 1997, p. 287); the skew was statistically significant in one colony—at least in smaller matrilines—but not significant in the other colony. Conversely, in one large seminatural colony, high-ranking females had significantly male-biased infant sex ratios (Meikle et al., 1984, p. 179), and in another large seminatural colony, maternal rank and infant sex ratio were not significantly correlated (Berman & Rawlins, 1985, p. 332; Rawlins & Kessler, 1986a, p. 12; Berman, 1988, p. 313). Paternal dominance rank had no apparent effect on infant sex ratio in a compound-housed colony (Small & Smith, 1985, p. 359).

Birth Rate, Infant Mortality Rate

The mean annual birth rate (births/sexually mature females) in natural populations of *M. mulatta* varies from 42.9% to 90.8% (Table 26); only three of 17 reported means are less than 63%. One of the three low outlier values is based on observations of 14 Indian temple groups; the other two are based on observations of the two northernmost populations for which birth rate data are available (Pakistan, 34°03′N; China, 35°10′–35°17′N). At both northern localities, females usually produce infants only in alternate years (Qu et al., 1993, p. 619). In captivity, the mean annual birth rate varies from 65.0% to 76.7% in four free-ranging colonies (Vandenbergh, 1973, p. 7; Rawlins & Kessler, 1986c, p. 52, live births to females age ≥4 years; Johnson & Kapsalis, 1995b, p. 273), and is 65.8% and 71.8% in two compound-housed colonies (Casebolt et al., 1985, p. 291; Goo, 1986, p. 75; cf. Litton & Izard, 1999, p. 74).

The reported mean annual infant mortality rate, during the first year of life, was 7.0% in southern

TABLE 25. Infant sex ratio in *Macaca mulatta*.

Locality or colony[1]	Infants N	Females	Males	Sex unknown	Male:female ratio	References[2]
Natural populations						
India: Dehra Dun	23	10	10	3	1.00	*1*
China: Longhushan	56	23	33	0	1.43	*2*
China: Nanwan	136	65	71	0	1.09	*3*
Totals	215	98	114	3	1.16	
Captive populations[3]						
Cayo Santiago, PR	1,407	665	720	22	1.08	*4*
CRPRC	815	399	398	18	1.00	*5*
DOGYU	311	161	150	0	0.93	*6*
La Parguera, PR	362	183	179	0	0.98	*7*
LBI	2,182	1,067	1,115	0	1.04	*8*
LPP	235	116	119	0	1.03	*8*
UCM	299	151	148	0	0.98	*9*
UMCG	169	83	83	3	1.00	*10*
WRPRC	1,616	808	808	0	1.00	*11*
YRPRCFS	97	37	55	5	1.49	*12*
Totals	7,493	3,670	3,775	48	1.03	

[1] CRPRC = California Regional Primate Research Center, Davis, CA; DOGYU = Department of Obstetrics and Gynecology, Yale University School of Medicine, New Haven, CT; LBI = Litton Bionetics, Inc., Kensington, MD; LPP = Laboratory of Perinatal Physiology, National Institute of Neurological Diseases and Stroke, San Juan, PR; UCM = University of Cambridge, Madingley, Cambridge, England; UMCG = University of Miami, Coral Gables, FL; WRPRC = Wisconsin Regional Primate Research Center, Madison, WI; YRPRCFS = Yerkes Regional Primate Research Center Field Station, Lawrenceville, GA.

[2] Key to references: *1.* Lindburg, 1971, p. 21. *2.* Wang et al., 1996, p. 268. *3.* Jiang et al., 1988a, p. 111. *4.* Rawlins & Kessler, 1986a, p. 12. *5.* Small & Smith, 1986, p. 295. *6.* van Wagenen, 1972, p. 9. *7.* Drickamer, 1974b, p. 76. *8.* Shaughnessy et al., 1978, p. 131. *9.* Nevison et al., 1996, p. 127. *10.* Taylor, 1994, p. 244. *11.* Dyke et al., 1986, p. 264. *12.* Bourne & Bourne, 1975, p. 271.

[3] Cf. Arnold & Hayward, 1998, p. 452.

China, 15.5% to 18.0% in northern India, 16.0% to 29.0% in Nepal, and 28.5% to 31.5% in northeastern China (Table 27). In a group of 19 primaparous captive females, the mortality rate (to age 6 months) of male infants (5/11) exceeded that of female infants (1/8) (Bercovitch et al., 1998, p. 138; cf. Dai et al., 1998, p. 30). When an infant dies, its mother often carries the corpse for several days, even after it has decayed; this has been observed in natural populations (Dodsworth, 1914, p. 730; Prakash, 1962, p. 85; Neville, 1968c, p. 18; Mukherjee, 1969, p. 55; Lindburg, 1971, p. 17; Taylor et al., 1978, p. 346; Shukla et al., 1984, p. 20) and in captive populations (Yerkes, 1915, p. 404; Carpenter, 1942c, p. 199; Koford, 1965, p. 169; Sade, 1968, p. 21; Rawlins & Kessler, 1983, p. 170).

Nursing, Weaning

In two captive groups, 41 infants (age 0–6 weeks) nursed from the left nipple approximately 50% more than from the right nipple (Tomaszycki et al., 1998, p. 308). In natural populations, infants sometimes begin to take small amounts of solid food at age 2 weeks, and mothers begin to resist nursing attempts about 3 months later (Lindburg, 1971, p. 84). The weaning process gradually intensifies over the next several months, but it may extend through the subsequent mating season and not be completed until the birth of the next infant, when the first infant is ca. 1 year old (Prakash, 1962, p. 85; Southwick et al., 1965, p. 156; Lindburg, 1971, pp. 63, 84). The weaning process in captive populations is generally similar to that in natural populations (Pocock, 1906, p. 569; Hartman, 1932, p. 22; Hinde et al., 1964, p. 637; Sade, 1968, p. 24; Vandenbergh & Vessey, 1968, p. 75; Gomendio, 1989, p. 452; Simpson & Tartabini, 1992, p. 31). An experimental study indicates that prolongation of the nursing period delays subsequent conception (Goo & Fugate, 1984, p. 67); the mean (±SD) interbirth interval of mothers of infants artificially weaned at age 6

TABLE 26. Annual birth rate (births/sexually mature females × 100) in natural populations of *Macaca mulatta*.

Sample area	Study period	No. of groups	Annual birth rate (%)		References[1]
			Mean	Extremes	
Pakistan					
Dunga Gali	1978–80	1	~50	—	*1*
India					
Delhi; Tughlaqabad[2]	1980–87	2–5	78.8	70.7–86.7	*2*
Uttar Pradesh					
Aligarh District	1961–85	8–21	83.7	75.4–90.4	*3*
	1990–91	8	82.2	60.0–90.2	*4*
Chhatari-do-Raha[2]	1959–79	2	90.3	72.7–100.0	*5*
	1990–91	2	80.7	80.0–80.8	*4*
Dehra Dun	1965–66	5	90.8	90.3–91.2	*6*
Northern India[3]					
Temple[2]	1981–91	14	42.9	—	*7*
Urban	1981–91	103	64.7	—	*7*
Village	1981–91	42	68.8	—	*7*
Village/pond	1981–91	60	64.2	—	*7*
Pond	1981–91	28	66.2	—	*7*
Roadside	1981–91	33	71.1	—	*7*
Canal side	1981–91	22	64.8	—	*7*
Forest	1981–91	70	64.1	—	*7*
Nepal					
Kathmandu Valley[2]	1975–78	12	63.0	51.0–73.0	*8*
China					
Hainan: Nanwan[2]	1978–90	2	~75	50.0–100.0	*9*
Guangxi: Longhushan	1988–95	6	75.4	45.0–100.0	*10*
Xianggang (= Hong Kong)[2,4]	1981	3	75.0	—	*11*
Henan: Jiyuan[2]	1987–88	2	46.9	30.1–66.7	*12*

[1] Key to references: *1.* Melnick et al., 1984, p. 343; Pearl & Goldstein, 1984, p. 203; Pearl et al., 1987, p. 38. *2.* Malik, 1989a, p. 118. *3.* Southwick & Siddiqi, 1988, p. 190; cf. 1994b, p. 56. *4.* Imam & Yahya, 1995, p. 6. *5.* Southwick & Siddiqi, 1983, p. 230. *6.* Lindburg, 1971, p. 20. *7.* Seth et al., 1992, p. 65. *8.* Southwick et al., 1980, p. 166; Teas, 1983, p. 224. *9.* Jiang Haisheng et al., 1991, p. 213; 1994, p. 168. *10.* Wang et al., 1996, p. 268. *11.* Southwick & Southwick, 1983, p. 22. *12.* Qu et al., 1993, pp. 613, 616; cf. Southwick et al., 1996, p. 101.

[2] Provisioned population.

[3] Seven states.

[4] Mixed-species groups; *M. mulatta* probably introduced (Herklots, 1951, p. 83; Marshall, 1967, p. 45).

months was 382 ± 34 days (n = 153), whereas that of mothers of infants artificially weaned at age 12 months was 403 ± 63 days (n = 147). If a mother fails to produce a second infant during the following birth season, she may suckle the first infant for 2 years (Hartman, 1929, p. 157; Fleischman, 1963, p. 706).

Menopause

In a natural population in India, one female apparently became menopausal and ceased mating activity at an estimated age of >20 years (Malik & Johnson, 1992, p. 28); subsequent to menopause, this female survived for 4 years. In three closely observed captives, menopause occurred at ages 26.9, 27.6, and 29.0 years (van Wagenen, 1972, p. 26; van Wagenen & Simpson, 1973, p. 24; cf. Hodgen et al., 1977, p. 582; Davis, 1985, p. 79; Ouyang & Ma, 1992, p. 14). One female in each of two other colonies apparently became menopausal as early as age ca. 17 years (Tilford, 1981, p. 638; Vančatová et al., 1986, p. 263). The frequency of menopause in old females reported in three studies of captive colonies is as follows: 49 females, ages 25 to 27 years, 43% menopausal (Johnson & Kapsalis, 1998, p. 757); seven females, ages 26 to 34 years, 71% menopausal (Walker, 1995, p. 61); 10 females, ages 28 to 34.6 years, 100% menopausal (Champ et al., 1996, p. 486). Based on hormone profiles of 26 captive females aged 21–29 years, 11 were determined to be premenopausal (mean age 22.5 years), 13 were determined to be perimenopausal (mean age 24.0 years), and 2 were determined to be postmenopausal (mean age 29.5 years)(Gilardi et al., 1997, p. 337). The greatest age at which a captive fe-

TABLE 27. Infant mortality rate in natural populations of *Macaca mulatta*.

Sample area	No. of groups	Study period	No. of years of data	Infant mortality rate[1] (%)		References[2]
				Mean ± SD	Extremes	
India						
Uttar Pradesh						
Aligarh District	8–21	1961–76[3]	15	18.0 ± 10.0	3.8–32.1	*1*
	8	1990–91	1	2.3	—	*2*
Chhatari-do-Raha	2	1961–76	16	15.5 ± 14.5	0–44.4	*1*
	2	1990–91	1	2.2	—	*2*
Nepal						
Kathmandu Valley						
Pashupati	5–6	1975–78	3	29.0 ± 2.6	27–32	*3*
Swayambhu	7–10	1975–78	3	16.0 ± 7.0	11–24	*3*
China						
Guangxi						
Longhu Shan	1–2	1988–95[4]	3	7.0 ± 3.8	3.7–11.1	*4*
Henan: Jiyuan						
Doudin	1	1987	1	31.5	—	*5*
Shagon	1	1987	1	28.5	—	*5*

[1] Annual infant deaths during first year of life/annual births.
[2] Key to references: *1*. Southwick et al., 1980, pp. 161–162. *2*. Imam & Yahya, 1995, p. 6. *3*. Teas et al., 1981, p. 119. *4*. Wang et al., 1996, p. 268. *5*. Qu et al., 1993, p. 616.
[3] Data for 1975 missing.
[4] Data available for 1988, 1989, and 1995.

male is known to have produced a living infant is ca. 28.5 years (Dyke et al., 1986, p. 264).

Males are known to remain capable of copulatory ejaculation to age ca. 30 years (Phoenix & Chambers, 1988, p. 159). However, in another series of copulatory tests of six healthy males age ca. 21 to 31 years (mean = 25 years), four (67%) failed to ejaculate (Chambers & Phoenix, 1992, p. 15; cf. Ouyang & Ma, 1992, p. 14).

The maximum reported longevity in captive *M. mulatta* is 37 years (Uno et al., 1998, p. 21; cf. Davis, 1985, p. 57; Erschler et al., 1988, p. 182).

Annual Mortality Rate

Annual mortality rates apparently are locally variable in natural populations of *M. mulatta*. In northern India, the annual mortality rate was approximately 2.2% in Aligarh District (Imam & Yahya, 1995, p. 7), 3.6% at Asarori Forest (Lindburg, 1971, p. 17), 3.7% at Tughlaqabad (3-year average; Malik et al., 1984, p. 317), and 9.6% at Dehra Dun (Lindburg, 1971, p. 17; cf. Southwick & M. F. Siddiqi, 1988, p. 190); in Nepal, the mortality rate was 19.0% at Swayambhu and 22.3% at Pashupati (3-year averages; Teas et al., 1981a, p. 119). In the free-ranging Cayo Santiago colony, the annual mortality rate was 6.8% (7-year average; Rawlins & Kessler, 1986c, p. 51).

Observed causes of death in natural populations include infanticide, intraspecific fighting, predation (dog, tiger), and an accidental fall from a cliff (Lindburg, 1971, p. 17; Camperio Ciani, 1984, p. 373; Singh, 1986, p. 607). In a provisioned Nepalese population, ca. 40 monkeys were accidentally electrocuted in 1996 (Shrestha, 1997, p. 31; Chalise & Ghimire, 1998, p. 11). During winter, members of northern populations apparently die of exposure or malnutrition (Pearl et al., 1987, p. 37; Qu et al., 1993, p. 613).

Population Growth Rate

Population growth rate estimates are available for 28 natural populations of *M. mulatta* (Table 28; cf. Ross, 1988, p. 218); for 14 of these populations, the census interval is 1 year, and for the remaining 14 the census interval is 3 to 32 years. In 12 of 14 populations with 1-year census intervals, annual growth rates vary from 3.8% to 26.9% (mean ± SD = 14.8% ± 6.8%); growth rates of the remaining two of these populations are outlier negative values (−9.5%, −15.9%). In the 14 populations with multiyear census inter-

vals, annualized growth rate tends to be greater in populations with shorter census intervals; in eight populations with census intervals less than 7 years, the mean annualized growth rate is 12.3% ± 5.9% (extremes, 0.9% and 19.1%), and in six populations with census intervals greater than 22 years, the mean annualized growth rate is 3.5% ± 4.5% (extremes, −0.4% and 9.1%). In three Nepalese populations, annualized growth rate tends to be low regardless of census interval length (3 years, 0.9%; 23 years, −0.3% and −0.4%); the explanation for this low rate of population increase in Nepal is unclear (Teas et al., 1981a, p. 120; Johnson et al., 1988, p. 179). In two areas on Hainan Dao, China, population growth rates apparently began to decline after optimum population densities were reached (Jiang et al., 1998, p. 101). In two free-ranging colonies introduced in Puerto Rico, the combination of relatively high population growth rates (13.5%, 16.5%) and relatively short census intervals (7 years, 9 years) is concordant with the norm for natural populations (see above).

Fossils and Subfossils

Published data concerning *M. mulatta* fossils and subfossils are meager and fragmentary (Table 29; cf. Szalay & Delson, 1979, pp. 356, 363; Delson, 1980, p. 20; Pan & Jablonski, 1987, p. 63; Jablonski & Pan, 1988, p. 859; Jablonski, 1990, p. 39; Xue & Zhang, 1991, p. 357). The most important implication of these data probably is that a macaque similar or identical to *M. mulatta* had become established within the present range of *M. mulatta* in China and Vietnam during or prior to Late Pleistocene (>40 Ka).

Systematics

Geographic Variation and Subspecific Recognition

Given the broad distribution and diverse habitats of *M. mulatta* (see above), it is not surprising that this species exhibits great variation in numerous characters. Based on individual or geographic variation, 15 species-group names have been proposed for application to this taxon (Fig. 21). In the first comprehensive subspecific revision of *M. mulatta*, six subspecies were recognized (Pocock, 1932, p. 533); in subsequent classifications, various combinations of 10 subspecies have been recognized (Table 30).

Although geographic variation in *M. mulatta* is clearly evident (see above), the differentiation of local and regional populations is now regarded as inadequate to warrant formal recognition of subspecies (cf. Fooden, 1995, p. 65). Where character-state transitions are gradual or irregular, as in *M. mulatta*, the delimitation of subspecies is arbitrary (cf. Mayr et al., 1953, p. 147), and unambiguous diagnosis of subspecies is virtually impossible. Problems concerning the delimitation of subspecies in *M. mulatta* have been discussed by Pocock (1932, p. 530), Napier (1981, p. 20), Corbet (1992, p. 170), Jiang Xuelong et al. (1995, p. 46), and Yu et al. (1996, p. 153). Unless future research reveals a pattern of geographic differentiation of characters that is much more coherent than is now known in *M. mulatta*, it appears unlikely that taxonomically useful subspecies can be defined in this species.

The principal characters that previously have been used in defining subspecies of *M. mulatta* are overall size, tail length, pelage color and length, and molecular diversity. The pattern of geographic variation in these characters has been discussed in detail above and is briefly summarized here.

Size—Overall size usually is measured as the combined length of head and body (based on flesh measurements recorded by the collector). Overall size presumably may also be inferred from greatest length of skull, excluding incisors; although skull length is not a direct measure of overall size, compared with head and body length, skull length usually is available for more specimens, and it is subject to less interobserver variability. Meaningful comparisons of size require measurements of fully adult specimens, segregated according to sex.

In *M. mulatta*, both head and body length and skull length tend to increase from south to north (Figs. 8, 17; Tables 3, 9). The large size of specimens collected north of 30°N in Afghanistan, Pakistan, and India in the west and disjunctly in China in the east is particularly striking. However, the latitudinal size gradient is gradual, and size distributions in local samples generally overlap (cf. Jiang Xuelong et al., 1991, p. 242). Size in insular samples is generally similar to that in continental samples collected at the same latitude (Figs. 8, 17).

TABLE 28. Population growth rate in *Macaca mulatta*.

Sample area	No. of groups observed	Census interval	Initial census	Final census	Annual/ annualized[1] population growth rate (%)	References[2]
One-year census intervals						
Pakistan						
Dunga Gali	3	1978–79	105	95	−9.5	*1*
India						
Jammu and Kashmir						
Jammu	1	1983–84	123	156	26.9	*2*
Himachal Pradesh						
Simla	2	1983–84	154	186	20.8	*2*
Solan	2	1983–84	89	108	21.3	*2*
Haryana						
Bhiwani	18	1983–84	523	621	18.7	*2*
Hissar	29	1983–84	910	1,045	14.8	*2*
Jind	30	1983–84	1,016	854	−15.9	*2*
Rohtak	28	1983–84	857	932	8.8	*2*
Delhi	22	1983–84	744	772	3.8	*2*
Rajasthan						
Alwan	8	1983–84	1,067	1,219	14.2	*2*
Jaipur	5	1983–84	335	353	5.4	*2*
Uttar Pradesh						
Aligarh vicinity	14	1990–91	651	669	2.8	*3*
Dehra Dun	18	1983–84	597	688	15.2	*2*
Ghaziabad	17	1983–84	705	785	11.3	*2*
Saharanpur	12	1983–84	448	524	17.0	*2*
Multiyear census intervals						
India						
Delhi						
Tughlaqabad[3]	1–5	1965–90 (25 yr)	68	~600	~9.1	*4*
Rajasthan						
Bandipul	1	1976–80 (4 yr)	86	140	13.0	*5*
Jaipur	2	1976–80 (4 yr)	74	113	11.2	*5*
Marot	2	1976–80 (4 yr)	87	128	10.1	*5*
Uttar Pradesh						
Aligarh District	8–21	1959–91 (32 yr)	~287	267	~−0.2	*6*
Chhatari-do-Raha[3]	2	1959–91 (32 yr)	~50	178	~4.0	*6*
Dehra Dun	2	1976–80 (4 yr)	57	113	18.7	*5*
Khair	2	1976–80 (4 yr)	96	171	15.5	*5*
Nepal						
Pashupati[3,4]	6–10	1975–98 (23 yr)	358	330	−0.4	*7, 8*
Swayambhu[3]	5–7	1975–98 (23 yr)	328	308	−0.3	*7, 8*
Tripureswor	1–?2	1995–98 (3 yr)	37	38	0.9	*8*
China						
Hainan: Nanwan[5,6]	5–20	1965–94 (29 yr)	~115	~1,300	~8.7	*9*
Guangxi: Longhu Shan	3–6	1985–90 (5 yr)	128	203	9.7	*10*
Henan: Jiyuan[5]	~26	1982–88 (6 yr)	~700	~2,000	~19.1	*11*
U.S.A.: Puerto Rico						
Cayo Santiago[3]	5–6	1976–83 (7 yr)	479	1,161	13.5	*12*
La Parguera[3]	4–7	1963[7]–72 (9 yr)	106	418	16.5	*13*

[1] Annualized growth rate = $[(C_2/C_1)^{1/Y}] - 1$, where Y = years in census interval, C_1 = initial census, and C_2 = final census.

[2] Key to references: *1.* Melnick et al., 1984, p. 344. *2.* Seth et al., 1992, p. 67. *3.* Imam & Yahya, 1995, p. 4. *4.* Malik et al., 1984, p. 314; Malik, 1989a, p. 118; Southwick & Siddiqi, 1995, p. 19. *5.* Seth & Seth, 1983, p. 63. *6.* Southwick & Siddiqi, 1988, p. 189; 1994b, p. 57. *7.* Teas et al., 1980, p. 252; 1981a, p. 119; Johnson et al., 1988, p. 179. *8.* Chalise & Ghimire, 1998, p. 14, 15. *9.* Jiang Haisheng et al., 1991, p. 213; 1998, p. 101. *10.* Wang et al., 1996, p. 266. *11.* Anonymous, 1985, p. 241; Qu et al., 1993, p. 608. *12.* Rawlins et al., 1984, p. 249; cf. Koford, 1965, p. 160; Boelkins & Wilson, 1972, p. 136. *13.* Drickamer, 1974b, p. 65.

[3] Provisioned.

TABLE 29. Localities and ages of *Macaca mulatta* fossils or subfossils.

Locality	Province/State	Latitude (N)	Longitude (E)	Epoch	Approximate age (Ka[1])	References[2]
			China			
Yin ruins	Henan	36°07′	114°19′	Holocene	2.5	*1, 2, 3*
Xiawanggang	Henan	~33°15′	~111°27′	Holocene	4.5–5.2	*2, 4, 5*
Zhengpiyan	Guangxi	~25°17′	~110°17′	Holocene	6.6	*2, 5, 6*
Hemuda	Zhejiang	~30°03′	~121°09′	Holocene	6–7	*2, 7*
Baoshan[3]	Yunnan	25°05′	99°05′	Holocene	7	*8*
Shuanglong Cave[3]	Zhejiang	29°12′	119°37′	Holocene	7.8	*9*
Xianren Cave	Jiangxi	28°45′	117°09′	Holocene	8.5	*2, 3, 10*
Shenxian Cave[3]	Jiangsu	~31°38′	~119°02′	Holocene/Pleistocene	11.2	*2, 5, 11*
Luoding[4]	Guangdong	22°40′	111°30′	Pleistocene[5]	10–120	*12*
Jiandaoqian Shan	Fujian	~24°30′	~117°30′	Pleistocene[6]	40–120	*13*
			Vietnam			
Keo Leng[3]	Lang Son	~21°57′	~106°23′	Pleistocene	20–30	*14, 15*
Lang Trang[3]	Than Hoa	20°21′	105°13′	Pleistocene	?	*15, 16*
			India			
Goalpara (= Gúlpara)	Assam	26°10′	90°37′	Holocene	?	*17*
Madras region	?Andhra Pradesh	?	?	Holocene	?	*17*

[1] Ka = thousands of years ago.

[2] Key to references: *1.* Teilhard de Chardin & Young, 1936, p. 53. *2.* Zhang, 1985, pp. 164, 165. *3.* Chang, 1986, pp. 100, 317. *4.* Chia & Chang, 1977, p. 49. *5.* Xue & Zhang, 1991, pp. 330, 331. *6.* Li & Han, 1978, p. 249. *7.* Chekiang Provincial Museum, 1978, p. 95; Wu, 1983, p. 165; Han, 1988, p. 869. *8.* Jablonski et al., 1994, p. 307. *9.* Ma & Tang, 1992, p. 310. *10.* Huang & Chi, 1963, p. 266. *11.* Li & Lei, 1980, p. 60. *12.* Gu et al., 1996, p. 247; Jablonski & Gu, 1996, p. 130. *13.* You & Cai, 1996, p. 341. *14.* Nguyen, 1985, p. 97; Olsen & Ciochon, 1990, pp. 764, 766. *15.* Nisbett & Ciochon, 1993, p. 774. *16.* Ciochon et al., 1990, pp. 112, 240. *17.* Lydekker, 1880, pp. 32, 33.

[3] Species identification provisional.

[4] Xiashan Cave and Shanbeiyan Cave.

[5] "[P]robable Late Pleistocene."

[6] "[E]arly Late Pleistocene."

TAIL LENGTH—Like head and body length, tail length in adults of both sexes of *M. mulatta* generally tends to increase from south to north (Fig. 9; Table 4). However, relatively long-tailed specimens collected in the Indochinese peninsula, near the southeastern limit of distribution of *M. mulatta*, constitute an important exception to this generalization; these aberrant specimens have been interpreted as the result of hybridization between *M. mulatta* and *M. fascicularis* (Fooden, 1997, p. 228). Because of the generally parallel latitudinal variation of tail length and head and body length in *M. mulatta*, relative tail length (tail length/head and body length) is relatively constant latitudinally, except in the extreme southeast, where it increases at lower latitudes (Fig. 11; Table 5). Longitudinally, tail length and relative tail length in *M. mulatta* tend to decrease east of ca. 105°E, again except in the extreme southeast (Fig. 12; Table 5). Both latitudinally and longitudinally, variation in tail length and relative tail length is gradual (Figs. 11, 12). In insular samples, tail length and relative tail length are similar to corresponding lengths in nearby continental samples (Figs. 9, 11).

PELAGE—Analysis of geographic variation in pelage color and pelage length in *M. mulatta* is complicated by age variation and particularly by seasonal variation (see above). However, when comparisons are restricted to postinfantile speci-

←

[4] In 1996, ca. 40 monkeys were accidentally electrocuted in this group.

[5] Includes two provisioned groups.

[6] In 1975–83, 189 monkeys were removed from this population for research purposes.

[7] Infants born in 1963 are included in a census of this population that was conducted in early 1964.

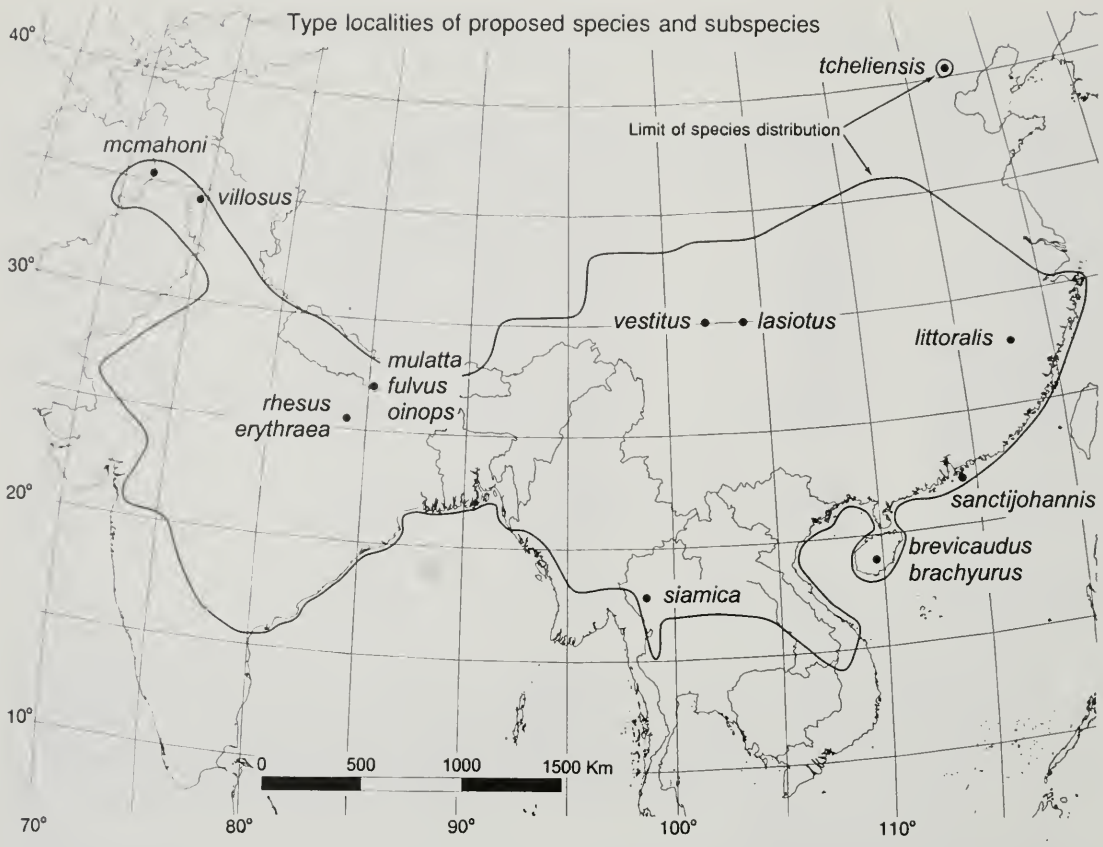

FIG. 21. Type localities of nominal species or subspecies allocated to *Macaca mulatta*; known limits of natural distribution of *Macaca mulatta* also indicated. Type locality references: *Cercopithecus* (*Mulatta*) Zimmermann, 1780, p. 120—"India"; restricted to "Nepal Tarai" by Pocock (1932, p. 533). *Cercopithecus fulvus* Kerr, 1792, pp. 32e, 73—objective synonym of *Cercopithecus* (*Mulatta*) Zimmermann. *Simia rhesus* Audebert, [1799], p. 5—provenance unknown; designated as "l'Inde . . . des bords du Gange" by F. Cuvier (1819, p. 2). *Simia Erythraea* Schreber, [1800], suppl. pl. 8c—objective synonym of *Simia rhesus* Audebert. *Macacus Oinops* Hodgson, 1841, p. 1212—"Tarai and lower Hills", Nepal; restricted to "Nepal Tarai" by Pocock (1932, p. 533). *Inuus sancti-johannis* Swinhoe, [1867], p. 556—"North Lena Island" (= Dangan Dao), Guangdong Province, China. *Macacus lasiotus* Gray, 1868, p. 60—"Szechwan" (= Sichuan Province), China. *Macacus Tcheliensis* Milne-Edwards, [1870], pls. 32, 33—"la cordiliere de l'est de la province du Tché-ly [= Hebei]", China. *Macacus vestitus* Milne-Edwards, 1892, p. 671—"Du Tengri-Nor à Batang," China; specified as "Tasin Lou" (= Kangding), Sichuan Province, China, on stand of mounted holotype. *Macacus rhesus villosus* True, 1894, p. 2—"Lolab, Kashmir, . . . 7,500 feet" (= Lolab, Jammu & Kashmir, 2300 m), India. *Pithecus littoralis* Elliot, 1909, p. 250—"Kuatun," Fujian Province, China. *Pithecus brachyurus* Elliot, 1909, p. 251—"Island of Hainan," China; specified as "Mt. Wuchi" (= Wuzhi Shan), Hainan Dao, China, on specimen tag of holotype; name is a permanently invalid junior primary homonym. *Pithecus brevicaudus* Elliot, 1913, p. 216—replacement name for *Pithecus brachyurus* Elliot. *Macaca siamica* Kloss, 1917, p. 247—"Me Ping rapids below Chiengmai, . . . 850 ft" (= Kaeng Mae Hat, Mae Nam Ping, 260 m), Thailand. *Macaca mulatta mcmahoni* Pocock, 1932, p. 544—"Kootai in Lower Chitral, between the Bashgal Valley in Kafiristan and the Chitral Valley; 3,600 ft." (= Kaotai, lower Kunar River, 1100 m), Pakistan.

mens in prime pelage, individual variation in pelage color apparently exceeds geographic variation in this species. Pelage color frequently differs strongly in individuals collected at the same locality (Fig. 3B), and pelage color frequently is similar or identical in individuals collected at localities separated by thousands of kilometers (see discussion above, "Pelage—Geographic Variation—Summary," p. 25; cf. Jiang Xuelong et al., 1991, p. 242). Although pelage length, both on body and appendages, tends to increase from south to north, the latitudinal transition is gradual (Figs. 6, 7).

MOLECULAR DIVERSITY—Although mtDNA haplotypes in *M. mulatta* generally are unique at each locality sampled, haplotypes in neighboring

TABLE 30. Subspecies recognized (x) in published classifications of *Macaca mulatta*, 1932–95.[1] Italicized code numbers indicate recognized subspecies to which unrecognized subspecies are referred in cited classifications; dash (—) indicates that proposed subspecies is not considered in cited classification.

Proposed subspecies			Authors[2] and dates of classifications								
Code no.	Name[3]	Date	Poc. 1932	Kel. 1945	EM-S 1951	Hill 1974	QWZ 1981	MW 1988	Peng 1990	JWM 1991	WJ 1995
1	*mulatta*	1780	x	x	x	x	x	x	x	x	x
2	*sanctijohannis*	1867	x	*1*	*1*	x	*1*[4]	*1*[4]	*1*[4]	*8*[5]	—
3	*lasiotus*	1868	x	*1*	*1*	x	*1*[4]	*5*[4]	*1*[4]	x[6]	x[6]
4	*tcheliensis*	1870	x	*1*	*1*	x	*1*[4]	*5*[4]	x	x[7]	x
5	*vestitus*	1892	—	*1*	x	*1*	x	x	x	x	x
6	*villosus*	1894	x	x	x	x	—	—	—	—	—
7	*littoralis*	1909	*2*	*1*	*1*	*2*	*1*[4]	*1*[4]	*1*[4]	x	x
8	*brevicaudus*	1913	*1*	*1*	*1*	*1*[6]	x	x[6]	x[6]	x	x
9	*siamica*	1917	*1*	*1*	*1*	*1*	—	—	—	*1*[4]	x
10	*mcmahoni*	1932	x	x	x	x	—	—	—	—	—

[1] Allen (1930, p. 1; 1938, p. 284), who did not publish a formal classification of subspecies of *M. mulatta*, expressed doubt concerning the distinctness of all proposed subspecies, with the possible exception of *M. m. vestita* and *M. m. villosa*; Corbet's (1992, p. 170) opinion is similar ("it is unlikely that discrete subspecies can be recognized").

[2] Key to abbreviations: Poc. = Pocock, p. 533; Kel. = Kellogg, p. 212 (similar classification subsequently published by Napier, 1981, p. 21); EM-S = Ellerman & Morrison-Scott, p. 197 (similar classifications subsequently published by Sanderson, 1957, p. 127; Napier & Napier, 1967, p. 404; Fa, 1989, p. 54; and Zhang et al., 1991, p. 177); Hill, p. 565; QWZ = Quan, Wang, & Zhang, p. 8 (classification repeated in Zhang et al., 1997, p. 58); MW = Ma & Wang, p. 252; Peng, 1990, p. 21; JWM = Jiang, Wang, & Ma, p. 242; WJ = Wang & Jiang, 1995, pp. 4, 9 (cf. Peng et al., 1993, p. 4; Zhang & Shi, 1993b, p. 600; Yao et al., 1995, p. 116).

[3] Termination as in original spelling of name.

[4] Allocation of unrecognized subspecies inferred from geographic distributions given for recognized subspecies.

[5] Unrecognized subspecies allocated provisionally.

[6] Cited by synonym or incorrectly spelled name.

[7] Recognized provisionally.

populations tend to be more similar than those in widely separated populations (see "Mitochondrial DNA" above); somewhat unexpectedly, known haplotypes in eastern *M. mulatta* are more similar to those in *M. cyclopis* and *M. fuscata* than they are to those in western *M. mulatta*. Further evaluation of the bearing of mtDNA data on subspecies determination in *M. mulatta* will require additional samples from precisely known, geographically intermediate localities. Few data are available concerning geographic variation of nuclear DNA in *M. mulatta* (see above). Available blood-protein allele frequency data (see above) also are inadequate for delimitation of subspecies in *M. mulatta*.

Synonymy

Macaca mulatta
(Zimmermann, 1780, p. 195)

Tawny [Monkey]: Pennant, 1771, p. 120—based on menagerie animal, not preserved; "Inhabits India."

Cercopithecus [sp.]: Erxleben, 1777, p. 43—generic allocation of Tawny Monkey: Pennant, 1771.

Cercopithecus (Mulatta) Zimmermann, 1780, p. 195—based solely on Tawny Monkey: Pennant, 1771; origin "Ostindien."

Cercopithecus malatta: Anderson, 1879, p. 56—incorrect spelling, not an available name.

Simia Mulatta: Goldfuss, 1809, p. 61—new combination.

Macaca mulatta: Hinton & Wroughton, 1921, p. 668—new combination; taxonomic history.

Macaca mulata: Tate, 1947, p. 132—incorrect spelling, not an available name.

Macaca mullatta: Khajuria, [1955], p. 114—incorrect spelling, not an available name.

M[acacus] mulatta: Dover, 1932, p. 244—new combination.

Rhesus mulatta: Furuya, 1962, p. 377–new combination.

Macaca mulatta mulatta: Pocock, 1932, p. 533—new rank; type locality restriction.

Macaca mullata mullata: Khajuria, [1955], p. 113—incorrect spelling, not an available name.

Macaque à queue courte: Buffon, 1789, p. 56, pl. 13—based on captive female, died 7 February 1778, skin formerly preserved "au cabinet du Roi"; provenance unspecified. Cuvier, 1819, p. 2—distribution, "l'Inde . . . des bords du Gange." Hinton & Wroughton, 1921, p. 668—synonym of *Cercopithecus mulatta* Zimmermann, 1780.

Cercopithecus fulvus Kerr, 1792, pp. 32e, 73—based solely on Tawny Monkey: Pennant, 1771; habitat, India. Hinton & Wroughton, 1921, p. 668—synonym of *Cercopithecus mulatta* Zimmermann, 1780. Pocock, 1932, p. 533—synonym of *Macaca mulatta mulatta* (Zimmermann, 1780).

Simia fulva: Shaw, 1800, p. 57—new combination. Anderson, 1879, p. 56—possible synonym of *Cercopithecus m[u]latta* Zimmermann, 1780.

Simia rhesus Audebert, [1799], p. 5—based on (1) captive female, not preserved, provenance unknown, and (2) Macaque à queue courte: Buffon, 1789. Cuvier, 1819, p. 2—distribution, "l'Inde . . . des bords du Gange." Fischer, 1829, p. 29—hardly separable from *Cercopithecus mulatta* Zimmermann, 1780. Anderson, 1879, pp. 55, 56—possible synonym of *Cercopithecus m[u]latta* Zimmermann, 1780. Hinton & Wroughton, 1921, p. 668—synonym of *Cercopithecus mulatta* Zimmermann, 1780. Pocock, 1932, p. 533—synonym of *Macaca mulatta mulatta* (Zimmermann, 1780).

Macaca rhesus: Daudin, 1802, p. 148—new combination.

Pithecus rhesus: É. Geoffroy, 1803, p. 25—new combination.

Cyn[ocephalus] rhesus: Latreille, 1804, p. 292—new combination.

Inuus rhesus: É. Geoffroy, 1812, p. 101—new combination.

Innuus Rhesus: Schinz, 1821, p. 113—incorrect spelling of generic name.

[M]acacus rhesus: Desmarest, 1820, p. 66—new combination.

Papio Rhesus: Ogilby, [1840], p. lix—new combination.

Papio Rhaesus: Percy, 1844, p. 83—incorrect spelling, not an available name.

[Silenus] rhesus: Stiles & Nolan, 1929, p. 533–new combination.

Simia Erythraea Schreber, [1800], suppl. pl. 8c—name proposed in caption of figure copied from illustration of Macaque à queue courte: Buffon, 1789, pl. 13; text published subsequently by Wagner, [1839], p. 142 (cf. Sherborn, 1892, pp. 590, 591). Goldfuss, 1809, p. 54—synonym of *Simia rhesus* Audebert, 1799. Cuvier, 1819, p. 2—distribution, "l'Inde . . . des bords du Gange." Anderson, 1879, p. 55—possible synonym of *Cercopithecus m[u]latta* Zimmermann, 1780. Blanford, [1888a], p. 625—taxonomic history. Hinton & Wroughton, 1921, p. 668—synonym of *Cercopithecus mulatta* Zimmermann, 1780. Pocock, 1932, p. 533—synonym of *Macaca mulatta mulatta* (Zimmermann, 1780).

Macacus erythraeus: I. Geoffroy, 1826, p. 588—new combination.

I[nuus] erythraeus: Wagner, [1839], p. 142—new combination.

Innuus (Maimon) erythraeus: Anderson, 1879, p. 56—incorrect spelling of generic name.

Pith[ecus] (Mac[acus]) erythraeus: Dahlbom, 1856, p. 116—new combination.

[Silenus] erythraeus: Stiles & Nolan, 1929, p. 529—new combination.

Wrinkled Baboon: Shaw, 1800, p. 33—based on Macaque à queue courte: Buffon, 1789, and *Simia erythraea* Schreber, [1800].

Macacus radiatus: Hodgson, 1834, p. 96 (not É. Geoffroy, 1812)—misidentification. Ogilby, [1840], p. lx—synonym of *[Simia] rhesus* Audebert, [1799].

Macacus [*(Pithex)*] *Oinops* Hodgson, 1841, p. 1212, fig. p. 1213—type series not specified, probably included among seven specimens (including three skulls only) collected in Nepal by B. H. Hodgson (date unknown): BM(NH) 1845.1.8.5 (skull only), 1845.1.8.222–224, 1858.6.24.144 (skull only), 1972.1013 (skull only, not seen), 1972.1015 (cf. Napier, 1981, p. 24); type locality, Nepal: "Tarai [= plain] and lower hills." Blyth, 1844, p. 475—probable synonym of *[Simia] rhesus* Audebert, [1799]. Gray, 1846, p. 2—synonym of *[Simia] rhesus* Audebert, [1799]. Wagner, [1851–55], p. 56—synonym of *Inuus erythraeus* (Schreber, [1800]). Wroughton, 1918, p. 555—lectotype designated, [BM(NH)] No. [18] 43.1.12.5 [No specimen numbered 1843.1.12.5 is now present in the BM(NH) collection; however, a note on the label of BM(NH) 1972.1015 indicates that this renumbered specimen may be the missing lectotype of *Macacus oinops*.] Hinton & Wroughton, 1921, p. 668—synonym of *Cercopithecus mulatta* Zimmermann, 1780. Pocock, 1932, p. 533—synonym of *Macaca mulatta mulatta* (Zimmermann, 1780). Napier, 1981, p. 24—probable type series cataloged.

Macaca cinops: Chiarelli, 1972, p. 208—incorrect spelling, not an available name.

[Macacus] Nipalensis Hodgson, 1841, p. 1212—manuscript name cited as a synonym of *Macacus [(Pithex)] Oinops* Hodgson, 1841, not an available name. Gray, 1846, p. 2—synonym of *[Simia] rhesus* Audebert, [1799]. Pocock, 1939, p. 45—synonym of *Macaca mulatta mulatta* (Zimmermann, 1780).

M[acacus] Pelops: Gray, 1843, p. 8 (not Hodgson, 1841)—misidentification. Hinton & Wroughton, 1921, p. 668—synonym of *Cercopithecus mulatta* Zimmermann, 1780.

Inuus pelops: Hutton, 1865, p. xiii (not Hodgson, 1841)—misidentification.

Inuus sancti-johannis Swinhoe, [1867], p. 556—holotype, BM(NH) 1868.12.29.10, juvenile female, skin and skull, collected alive at North Lena Island (= Dangan Dao), Guangdong, China, by Commander St. John, ca. June 1866, died in captivity ca. December 1868. Swinhoe, [1871], p. 615—type history. Sclater, 1871, p. 222—possible synonym of *[Simia] rhesus* Audebert, [1799]. Allen, 1930, p. 2—synonym of *Cercopithecus mulatta* Zimmermann, 1780. Kellogg, 1945, p. 121—synonym of *Macaca mulatta mulatta* (Zimmermann, 1780). Napier, 1981, p. 22—holotype cataloged. Jiang Xuelong et al., 1991, p. 243—provisional synonym of *M[acaca] mulatta brevicaudus* (Elliot, 1913).

Innus sancti-johannis: Matschie, 1912, p. 306—incorrect spelling of generic name.

Innuus sancti-johannis: Pocock, 1932, p. 546—incorrect spelling of generic name.

Macacus sancti-johannis: Swinhoe, 1870, p. 615—new combination.

Pithecus sancti-johannis: Elliot, 1913, p. 198—new combination.

[*Silenus*] *sancti-johannis*: Stiles & Nolan, 1929, p. 535—new combination.

Macaca mulatta sancti-johannis: Pocock, 1932, p. 546—new rank.

Macacus lasiotus Gray, 1868, p. 60—holotype, BM(NH) 1871.4.21.4, adult male, skin, skull, and skeleton (No. 1561a); bobtailed captive shipped from Shanghai by relative of C. A. Winkworth, who presented captive to Zoological Society of London, 15 January 1868; captive died 25 May 1870; reported origin, "Szechwan" (= Sichuan Province), China. Sclater, 1871, p. 221—type history; possible synonym of [*Simia*] *rhesus* Audebert, [1799]. Allen, 1930, p. 2—synonym of *Cercopithecus mulatta* Zimmermann, 1780. Kellogg, 1945, p. 121—synonym of *Macaca mulatta mulatta* (Zimmermann, 1780), Napier, 1981, p. 22—holotype cataloged.

Macacus lasiotis: Gray, 1868, figure caption—inadvertent misspelling (cf. text), not an available name.

Macacus lariotis: Mollendorf, 1889, p. 9—incorrect spelling, not an available name.

I[*nuus*] *lasiotus*: Blyth, 1875, p. 5—new combination.

Pithecus lasiotis: Elliot, 1913, p. 198—new combination.

[*Silenus*] *lasiotis*: Stiles & Nolan, 1929, p. 531—new combination.

Macaca mulatta lasiotus: Pocock, 1932, p. 548—new rank.

Macacus Tcheliensis Milne-Edwards, [1870], captions for plates 32 and 33—holotype, MNHN 335/281A/1867-557 (Type Cat. No. 61), juvenile female, skin and skull (lacking mandible), collected in mountains of eastern "Tché-ly" (= Hebei) Province by M. Fontanier, 1867. Milne-Edwards, [1872], pp. 227, 229—external and cranial characters; taxonomy, possibly a synonym of *M*[*acacus*] *lasiotus* Gray, 1868. Anderson, 1879, p. 83—synonym of *Macacus lasiotus* Gray, 1868. Osgood, 1932, p. 209—provisional synonym of *Cercopithecus mulatta* Zimmermann, 1780. Ho, 1935, p. 139—synonym of *Cercopithecus mulatta* Zimmermann, 1780. Rode, 1938, p. 224—holotype cataloged. Kellogg, 1945, p. 121—synonym of *Macaca mulatta mulatta* (Zimmermann, 1780).

M[*acacus*] *tchiliensis*: Blyth, 1875, p. 6—incorrect spelling, not an available name. Anderson in Blyth, 1875, p. 6—probable synonym of *M*[*acacus*] *lasiotus* Gray, 1868.

Macaca tcheliensis: Flower, 1931, p. 154—new combination.

[*Macacus lasiotis*] *tcheliensis*: Trouessart, 1897, p. 27—new rank.

Macaca lasiotis tscheliensis: de Beaux, 1923, p. 28—incorrect spelling, not an available name.

[*Silenus*] *lasiotis tcheliensis*: Stiles & Nolan, 1929, p. 531—new combination.

Macaca mulatta tcheliensis: Pocock, 1932, p. 550—new combination. Jiang Xuelong et al., 1991, p. 245—validity of subspecies questionable.

M[*acaca*] *m*[*ulatta*] *teheliensis*: Jiang Xuelong et al., 1991, p. 241—incorrect spelling, not an available name.

Macacus vestitus Milne-Edwards, 1892, p. 671—holotype, MNHN 334/282F/1891-388 (Type Cat. No. 59; Coll. No. 52), adult male, skin and skull, collected at "Tasin-Lou" (= Kangding), Sichuan Province, China, by H. d'Orleans, June–July 1890; paratype, young female, purchased alive at "Houmda"/"Kian Tatie" (= Ngamda), Xizang Province, China, by H. d'Orleans, 7 May 1890, living in menagerie of MNHN 22 August 1892, probably MNHN C.G.1892-315 or C.G.1894-1432 (both skins only, "Tibet"). Osgood, 1932, p. 209—provisional synonym of *Cercopithecus mulatta* Zimmermann, 1780. Rode, 1938, p. 223—holotype cataloged. Kellogg, 1945, p. 121—synonym of *Macaca mulatta mulatta* (Zimmermann, 1780).

Pithecus vestitus: Elliot, 1913—new combination.

Macaca vestitus: Rode, 1938, p. 223—new combination.

Macaca mulatta vestita: Ellerman & Morrison-Scott, 1951, p. 198—new rank.

Macacus rhesus villosus True, 1894, p. 2—holotype, USNM 20120/35485 (Coll. No. IV), adult male, skin and skull, collected at Lolab, Jammu & Kashmir, India, by W. L. Abbott, 8 September 1891; paratypes, USNM 20121/35486 (Coll. No. 5, juvenile male, 9 September), USNM 20122/38172 (Coll. No. 6, juvenile male, 9 September), USNM 20123/35488 (Coll. No. 7, subadult male, 8 September), USNM 20124/35489 (Coll. No. 8, subadult male, 9 September), skins and skulls, collected at Lolab, Jammu & Kashmir, India, by W. L. Abbott, 1891. Blanford, 1891, p. 361—synonym of *Macaca assamensis* McClelland in Horsfield, [1840]. Lyon & Osgood, 1909, p. 285—holotype cataloged. Allen, 1930, p. 1—"doubtfully distinct race." Poole & Schantz, 1942, p. 245—holotype catalogued.

M[*acaca*] *rhesus villosus*: Wroughton, 1918, p. 544—new combination.

Macaca mulatta villosa: Pocock, 1932, p. 539—new combination.

[*Macacus*] *villosus*: Trouessart, 1897, p. 27—new rank.

Pithecus villosus: Elliot, 1913, p. 200—new combination.

M[*acacus*] *assamensis*: Blanford, 1898, p. 361 (not McClelland in Horsfield, [1840]—misidentification.

Pithecus assamensis: Wroughton, 1915a, p. 464 (not McClelland in Horsfield, [1840]—misidentification. Hinton & Wroughton, 1921, p. 668—synonym of *Cercopithecus mulatta* Zimmermann, 1780.

Macaca assamensis: Wroughton, 1916c, p. 763 (not McClelland in Horsfield, [1840]—misidentification.

Pithecus littoralis Elliot, 1909, p. 250—holotype, BM(NH) 1900.5.8.1 (Coll. No. a), adult female, skin and skull, collected at Kuatun, Fujian Province, China, by C. B. Rickett, November 1898; paratypes, BM(NH) 1898.11.1.29 (juvenile male, skin and skull, purchased at Kuatun, Fujian Province, China, by J. de la Touche, 12 May 1898), BM(NH) 1871.3.3.5 (juvenile female, menagerie animal, skin and skull, obtained from Zoological Society of London before 1872, provenance reportedly "Kashmir"). Allen, 1930, p. 2—synonym of *Cercopithecus mulatta* Zimmermann, 1780. Pocock, 1932, p. 546—synonym of *Macaca mulatta sancti-johannis* (Swinhoe, [1867]). Kellogg, 1945, p.

121—synonym of *Macaca mulatta mulatta* (Zimmermann, 1780). Napier, 1981, pp. 22, 25—type series cataloged.

M[acaca] mulatta littoralis: Jiang Xuelong et al., 1991, p. 244—new rank.

Pithecus brachyurus Elliot, 1909, p. 251 (not *Macacus brachyurus* Smith, 1842, p. 103)—holotype, AMNH 27577, adult male, skin and skull, collected at Mt. Wuchi (= Wuzhi Shan), Hainan Dao, China, by A. Owston, 10 October 1905; paratypes (inexplicitly cited in original description), AMNH 26646 (Coll. No. 13/16, adult male, skin and skull, collected at Henron, Hainan Dao, China by A. Owston, 10 May 1904), AMNH 27568 (infant male, 1 October), 27569 (juvenile female, 2 October), 27570 (juvenile female, 3 October), 27571 (adult female, 4 October), 27572 (subadult male, 5 October), 27573 (adult female, 5 October), 27574 (adult female, 6 October), 27575 (juvenile female, 7 October), 27578 (subadult female, 30 October), BM(NH) 1909.7.11.1 (Coll. No. 13, AMNH 27576, juvenile male, 10 October), collected at Wuzhi Shan, Hainan Dao, China, by A. Owston, 1905. Elliot, 1913, p. 217—homonym of *Macacus brachyurus* Smith, 1842; replaced by *Pithecus brevicaudus* Elliot, 1913.

Macaca mulatta brachyurus: Xu et al., 1983, p. 312—new rank.

Pithecus brevicaudus Elliot, 1913, p. 216—replacement name for *Pithecus brachyurus* Elliot, 1909, junior homonym of *Macacus brachyurus* Smith, 1842. Pocock, 1932, p. 533—synonym of *Macaca mulatta mulatta* (Zimmermann, 1780).

Pithecus brevicaudatus: Fiedler, 1956, p. 179—incorrect spelling, not an available name.

Macacus brevicaudus: Mell, 1922, p. 11—new combination.

M[acaca] brevicaudatus: Tate, 1947, p. 134—new combination; incorrect spelling, not an available name; "doubtfully valid form."

M[acaca] m[*ulatta*] *brevicaudus*: Quan et al., 1981, p. 8—new rank.

M[acaca] m[ulatta] brovicaudata: Peng, 1990, p. 21—incorrect spelling, not an available name.

Macaca siamica Kloss, 1917, p. 247—holotype, ZRC 4-188/2530 (Coll. No. 320), adult male, skin and skull, collected at Me Ping rapids, 850 ft (= Kaeng Mae Hat, Mae Nam Ping, 260 m), below Chiang Mai, Thailand, by K. G. Gairdner, 14 April 1916. Pocock, 1932, p. 533—synonym of *Macaca mulatta mulatta* (Zimmermann, 1780). Weitzel et al., 1988, p. 116—holotype cataloged.

Macaca simica: Yang & Chou, 1984, p. 56—incorrect spelling, not an available name.

M[acaca] m[ulatta] siamica: Tate, 1947, p. 134—new rank.

Macaca mulatta mcmahoni Pocock, 1932, p. 544—holotype, BM(NH) 1920.6.11.1, adult male, skin and skull, collected at Kootai, lower Chitral, 3600 ft (= Kaotai, lower Kunar River, 1100 m), Pakistan, by F. D. Stirling, early February 1914; paratype, BM(NH) 1931.1.9.1, [adult male], skin only, obtained alive in eastern Nurestan, Pakistan, by H. McMahon, received at Regents Park Zoo 3 April 1906, died 19 January 1910. Napier, 1981, p. 24—type series cataloged.

[*Macaca mulatta*] *momahoni*: Buettner-Janusch, 1963, p. 52—incorrect spelling, not an available name.

[*Macaca mulatta*] *momahori*: Peng et al., 1993, p. 4—incorrect spelling, not an available name.

M[acaca] m[ulatta] momachori: Peng et al., 1993, p. 5—incorrect spelling, not an available name.

Type

Cercopithecus mulatta Zimmermann, 1780 (p. 195), is expressly based on Pennant's (1771, p. 120) brief characterization of a menagerie captive that he observed, presumably in London, "in Mr. Brooks's exhibition." No part of the captive, which Pennant designated as the Tawny Monkey, is known to have been preserved.

In an addendum, Pennant (1771, p. xxiii, pl. XIII.A, fig. II) characterized and figured a second monkey (unpreserved, species unidentified) that he regarded as a "variety" of the Tawny Monkey. This second monkey also is cited as a "Spielart" in Zimmermann's (1780, p. 195) original description of *Cercopithecus mulatta*. As an acknowledged variant, the second monkey does not qualify as a syntype of *Cercopithecus mulatta* (International Code of Zoological Nomenclature, 1985, Article 72[b]:i). Although the holotype of *Cercopithecus mulatta* Zimmermann appears not to have been preserved, designation of a neotype is not appropriate here. Article 75(a) of the International Code of Zoological Nomenclature (1985) specifies that a neotype is to be designated "only in exceptional circumstances when a neotype is necessary in the interests of stability of nomenclature." Because such circumstances do not apply to *M. mulatta*, designation of a neotype for this species would have no standing (Article 75[c]).

Type Locality

Concerning the geographic origin of the Tawny Monkey, Pennant (1771, p. 120) merely commented, "Inhabits *India*" (italics in original). Zimmermann (1780, p. 195) rephrased this comment as "Er kam aus Ostindien." Based on the type locality of *Macacus oinops* Hodgson, 1841, a subjective synonym of *Cercopithecus mulatta* Zimmermann, 1780, Pocock (1932, p. 533) restricted the type locality of *M. mulatta* to "Nepal Tarai"—that is, the belt of Nepalese lowlands

(Terai) that extends along the border between Nepal and India (Fig. 21).

Evolution and Dispersal

Fossil evidence indicates that a macaque similar or identical to *M. mulatta* inhabited Vietnam ca. 20 to 30 Ka and inhabited eastern China ca. 40 to 120 Ka (Table 29). This evidence estabishes minimum dates for the existence of *M. mulatta*, or a close relative, in eastern Asia; the actual date of first appearance of this species in this region may of course be much earlier. Following is a hypothetical interpretation of the evolutionary and geographical history of this species, based primarily on variation in relative tail length (Fig. 22).

M. mulatta is a member of the *fascicularis* group of macaques, which also includes M. *fascicularis* in peninsular and insular Southeast Asia, *M. cyclopis* in Taiwan, and *M. fuscata* in Japan (cf. Fooden & Albrecht, 1999, p. 432; Morales & Melnick, 1998, p. 17). In these species, relative tail length generally decreases as latitude increases, in accord with Allen's rule (Table 31).

Assuming that reduced relative tail length is a shared derived character state in the *fascicularis* group, *M. fascicularis* may be regarded as the primitive sister group of *M. cyclopis*, *M. mulatta*, and *M. fuscata*. Initial reduction of relative tail length and splitting of the derived species from *M. fascicularis* presumably occurred before ca. 40 Ka, in or near the northern part of the Indochinese peninsula (Fig. 22A); reduction of relative tail length in this area probably was an evolutionary response to lower ambient temperatures encountered by a *fascicularis* group population as it dispersed northward from its ancestral tropical habitat. The latitudinal range of the northward-dispersing *fascicularis* group population eventually extended to at least ca. 40°N in eastern Asia.

Although relative tail length in the *fascicularis* group generally decreases with increasing latitude, this correlation does not apply to southern populations of *M. mulatta* (ca. 15–25°N), in which relative tail length is similar to that in conspecific northern populations (Fig. 11) and therefore is less than expected according to Allen's rule. This suggests that southern populations of *M. mulatta* did not originate within their present latitudinal zone but instead dispersed there relatively recently from farther northward (cf. Fooden & Albrecht, 1999, p. 438). Judging from the general relationship between latitude and relative tail length in the *fascicularis* group, relative tail length in the population of this group that originally inhabited the 15 to 25°N latitudinal zone probably was similar to that in *M. cyclopis*. This interpretation assumes that evolutionary shortening of a long tail in response to cooler climate occurs more readily than evolutionary lengthening of a short tail in response to warmer climate (cf. *M. fuscata*, Figs. 22 A, B; *M. a. assamensis*, Fooden, 1988, pp. 4, 9).

Mean relative tail length in the northward-dispersing *fascicularis* group population apparently varied from ca. 0.90 at ca. 20°N to ca. 0.30 at ca. 40°N; conversely, body size and pelage length and density presumably increased at higher latitudes (Figs. 6, 8). At this evolutionary stage, the progenitors of *M. cyclopis* (mean relative tail length ca. 0.90) presumably dispersed from the mainland to Taiwan, and the progenitors, of *M. fuscata* (mean relative tail length ca. 0.30) dispersed from the mainland to the Japanese islands. There is no evidence that the southern *fascicularis* group population (15–25°N) with mean relative tail length ca. 0.90 dispersed northwest of the Indochinese peninsula; this suggests that a barrier to northwestward dispersal may have existed during this stage in the evolution of the *fascicularis* group.

As indicated above, the evidence of relative tail length suggests that an *M. mulatta* population (mean relative tail length <0.50) dispersed southward and replaced the *cyclopis*-like population (mean relative tail length ca. 0.90) that is postulated to have originally inhabited the 15°–25°N latitudinal zone in mainland eastern Asia (Fig. 22B); as a result of this replacement, *M. cyclopis* became relictual in Taiwan. The southward dispersal of *M. mulatta* and the correlated replacement of the aboriginal mainland *cyclopis*-like population may have occurred during the last glacial maximum (ca. 18 Ka), when climatic deterioration rendered the northern part of the present range of *M. mulatta* unsuitable for habitation by this species (Xu, 1988, p. 875; Tong & Shao, 1991, p. 65; Tong & Zhang, 1991, p. 389; Winkler & Wang, 1993, p. 245; Zheng & Lei, 1999, p. 357). Before or during the southward shift of the range of *M. mulatta* in eastern Asia, a west-east gradient of declining relative tail length apparently had become established in this species (100°E, mean relative tail length ca. 0.45; 120°E, mean relative tail length ca. 0.30) (Fig. 12); the factors

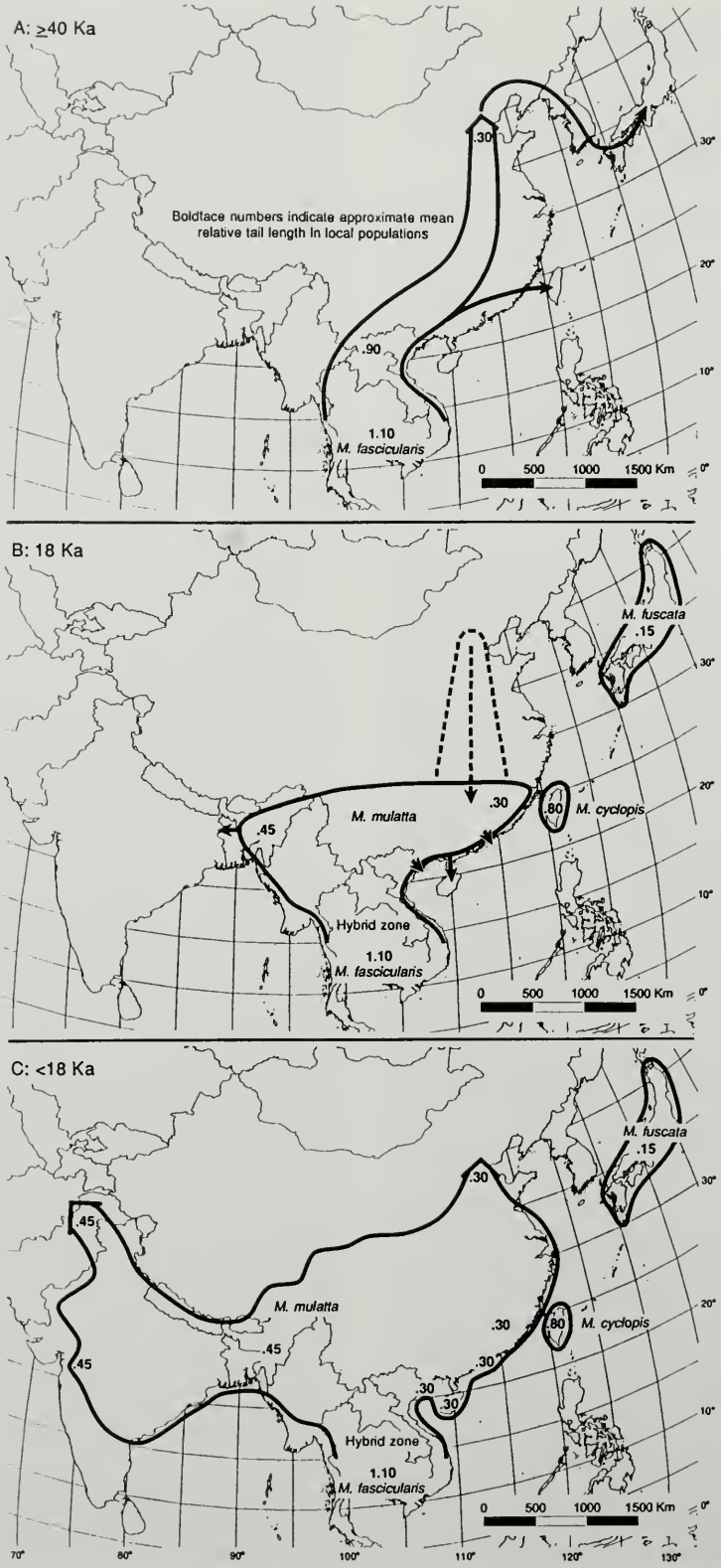
A: ≥40 Ka
Boldface numbers indicate approximate mean relative tail length in local populations
.30
.90
1.10
M. fascicularis
0 500 1000 1500 Km
B: 18 Ka
M. fuscata
.15
M. mulatta
.30
.80
M. cyclopis
.45
Hybrid zone
1.10
M. fascicularis
0 500 1000 1500 Km
C: <18 Ka
M. fuscata
.15
.30
.45
M. mulatta
.30
.80
M. cyclopis
.45
.30
.30
.30
Hybrid zone
1.10
M. fascicularis
0 500 1000 1500 Km
70°
80°
90°
100°
110°
120°
130°
30°
20°
10°
0°

TABLE 31. Latitudinal range and relative tail length (tail length/head and body length) in *fascicularis*-group species of macaques (Fooden & Albrecht, 1999, fig. 2).

Species	Latitudinal range	Relative tail length (%) in adults		N
		Mean ± SD	Extremes	
M. fascicularis	10°S–21°N	116.9 ± 14.4	69.2–149.5	393
M. cyclopis	22°N–25°N	82.9 ± 6.3	69.2–94.7	26
M. mulatta	15°N–41°N	44.4 ± 8.9	20.0–72.1	120
M. fuscata	30°N–41°N	13.5 ± 2.7	9.5–18.6	7

responsible for establishing this west-east gradient in relative tail length in eastern Asia are obscure.

In addition to displacing the *cyclopis*-like population that formerly inhabited mainland eastern Asia, the southward dispersal of *M. mulatta* to the 15°–25°N latitudinal zone apparently had three further zoogeographic consequences: (1) Eastern members of the *M. mulatta* population (mean relative tail length ca. 0.30) apparently dispersed to Hainan and two groups of smaller shallow-water islands in the South China Sea (Fig. 22B; cf. Pan et al., 1992, p. 42); during the last glacial maximum, these present-day islands were connected to continental Asia by dry land (Fooden,1995, p. 12). (2) Western members of the *M. mulatta* population (mean relative tail length ca. 0.45) may have dispersed westward, perhaps marking the entrance of *M. mulatta* into the Indian subregion, which ultimately may have contributed to local disappearance of *sinica*-group species of macaques (Fooden, 1989, p. 42); a Holocene fossil of *M. mulatta* has been reported in the Madras region (ca. 80°E; Table 29), and archaeological evidence indicates that this species was known at Moenjo Daro (27°19'N, 68°07'E) ca. 4 Ka (see "Geographic Distribution," pp. 2 *ff.*). (3) In the south, *M. mulatta* contacted *M. fascicularis*; this contact apparently has resulted in limited hybridization between *M. mulatta* and *M. fascicularis* (Fooden, 1997, p. 226).

Subsequent to the last glacial maximum, as the climate at higher latitudes ameliorated, *M. mulatta* in eastern Asia apparently redispersed northward and reoccupied the northern area it had previously vacated (Fig. 22C). The western population of *M. mulatta* also dispersed to higher latitudes in the Indian subregion, apparently retaining the relative tail length (ca. 0.45) of its putative founders (Table 5). Eastern and western populations of *M. mulatta* at higher latitudes are similar in their enhanced body size, pelage length, and pelage density (Figs. 6, 8; Table 3); this similarity presumably is the result of parallel adaptation to cool temperature.

The above scenario is compatible with major findings concerning geographic variation in mtDNA haplotypes in *M. mulatta* and other *fascicularis* group species (see above). The similarity of haplotypes in eastern *M. mulatta*, *M. cyclopis*, and *M. fuscata* may be attributable to the common origin of these three groups from *M. fascicularis* (Fig. 22A). The divergence of haplotypes in western *M. mulatta* and, independently, in Hainanese *M. mulatta* from those in eastern *M. mulatta* may be attributable to the presence of distinctive haplotypes in founders of the western and Hainanese populations (Fig. 22B).

Acknowledgments

For access to specimens and generous cooperation, I am deeply grateful to curators and staff members of institutions cited above (see "Introduction"). For helpful discussions, useful supplementary information, and other assistance, I also thank D. Brandon-Jones and P. D. Jenkins (British Museum [Natural History]); D. J. Melnick and J. C. Morales (Columbia University); J. Bates, L. R. Heaney, J. C. Kerbis Peterhans, B. D. Patterson, and J. Weinstein (Field Museum of Natural History); Zhang Yongzu (Institute of Geography, Chinese Academy of Sciences); Liu Wanfu (Forestry Department of Guangxi); Wu Mingchuan (Forestry Designing Center of Guangxi); Feng

←

FIG. 22. Hypothetical stages in the evolution and dispersal of *Macaca mulatta*, based primarily on variation in relative tail length in *fascicularis*-group species.

Zuojian and Quan Guoqiang (Institute of Zoology, Chinese Academy of Sciences); E. Delson (Lehman College, City University of New York); and M. K. Chalise (Natural History Society of Nepal). Preparation of this monograph was partly supported by the Barbara E. Brown Fund for Mammal Research.

Literature Cited

ADACHI, M., R. SAITO, AND Y. TANIOKA. 1982. Observation of delivery behavior in the rhesus monkey. Primates, **23:** 583–586.

ADMINISTRATIVE DIVISIONS OF THE PEOPLE'S REPUBLIC OF CHINA—1980. 1981. Cartographic Publishing House, Beijing, 168 pp.

AGGIMARANGSEE, N. 1992. Survey for semi-tame colonies of macaques in Thailand. Natural History Bulletin of the Siam Society, **40:** 103–166.

AGRAWAL, V. C., AND T. P. BHATIACHARYYA. 1976. Report on a collection of mammals from Nagarjuna Sagar, Andhra Pradesh. Newsletter of the Zoological Survey of India, **2:** 212–216.

———. 1977. Report on a collection of mammals from Tripura. Records of the Zoological Survey of India, **73:** 135–157.

AHSAN, M. F. 1994. Feeding ecology of the primates of Bangladesh, pp. 79–86. *In* Thierry, B., J. R. Anderson, J. J. Roeder, and N. Herrenschmidt, eds., Current Primatology: Volume I. Ecology and Evolution. Université Louis Pasteur, Strasbourg.

AKERS, J. S., AND C. H. CONAWAY. 1979. Female homosexual behavior in *Macaca mulatta*. Archives of Sexual Behavior, **8:** 63–80.

ALBRECHT, G. H. 1978. The craniofacial morphology of the Sulawesi macaques: Multivariate approaches to biological problems. Contributions to Primatology, **13:** viii + 151 pp.

ALFRED, J. R. B., AND J. P. SATI. 1990. Survey and census of the hoolock gibbon in West Garo Hills, Northeast India. Primates, **31:** 299–306.

ALLEN, E. 1926. Progress of work on the menstrual cycle of the monkey, *Macacus rhesus*. Anatomical Record, **32:** 226.

———. 1927. The menstrual cycle of the monkey, *Macacus rhesus*: Observations on normal animals, the effects of removal of the ovaries and the effects of injections of ovarian and placental extracts into the spayed animals. Contributions to Embryology, **98:** 1–44.

ALLEN, G. M. 1930. Primates and pangolins from the Asiatic Expeditions. American Museum Novitates, **429:** 1–7.

———. 1938. The Mammals of China and Mongolia. American Museum of Natural History, New York, 620 pp.

ALLEN, G. M., AND H. J. COOLIDGE, JR. 1940. Mammal and bird collections of the Asiatic Primate Expedition. Mammals. Bulletin of the Museum of Comparative Zoölogy at Harvard College, **87:** 131–166.

ALLEN, J. A. 1906. Mammals from the Island of Hainan. Bulletin of the American Museum of Natural History, **22:** 463–490.

ALTMANN, S. A. 1962. A field study of the sociobiology of rhesus monkeys, *Macaca mulatta*. Annals of the New York Academy of Sciences, **102:** 338–435.

ANAND KUMAR, T. C., G. F. X. DAVID, D. N. SHARMA, C. P. PURI, V. PURI, A. K. DUBEY, A. SEHGAL, A. SANKARANARAYANAN, AND J. S. PRUTHI. 1980. Reproductive profile of the rhesus monkey with reference to the testing of contraceptives, pp. 37–49. *In* Anand Kumar, T. C., ed., Non-human primate models for study of human reproduction, S. Karger, Basel.

ANDERSON, J. 1872. On a supposed new monkey from the Sunderbunds to the east of Calcutta. Proceedings of the Zoological Society of London, **1872:** 529–533.

———. 1876. Mandalay to Momien: A Narrative of the Two Expeditions to Western China of 1868 and 1875 under Colonel Edward B. Sladen and Colonel Horace Browne. Macmillan and Co., London, 479 pp.

———. 1879. Anatomical and Zoological Researches: Comprising an Account of the Zoological Results of the Two Expeditions to Western Yunnan in 1868 and 1875, Volume 1. Bernard Quaritch, London, xxv + 985 pp. (For date of publication, see Corrigenda, between pp. xii and xiii.)

———. 1881. Catalogue of Mammalia in the Indian Museum, Calcutta. Part I. Primates, Prosimiae, Chiroptera, and Insectivora. Indian Museum, Calcutta, xv + 225 pp.

ANDERSON, J. R., P. PEIGNOT, AND C. ADELBRECHT. 1992. Task-directed and recreational underwater swimming in captive rhesus monkeys (*Macaca mulatta*). Laboratory Primate Newsletter, **31:** 1–4.

ANDERSON, J. R., P. PEIGNOT, C. ADELBRECHT, S. FONTAINE, AND C. PEUGEOT. 1994. Social correlates of performance on an underwater foraging task in rhesus monkeys, pp. 355–362. *In* Roeder, J. J., B. Thierry, J. R. Anderson, and N. Herrenschmidt, eds., Current Primatology: Volume II. Social Development, Learning and Behavior. Université Louis Pasteur, Strasbourg.

ANDREWS, R. C. 1932. Part I.—Explorations in Mongolia, pp. 1–453. *In* Andrews, R. C., ed., The New Conquest of Central Asia. American Museum of Natural History, New York.

ANDREWS, R. C., AND Y. B. ANDREWS. 1918. Camps and Trails in China. D. Appleton and Company, New York, xxi + 334 pp.

ANONYMOUS. 1973. Skin color used to estimate time of ovulation in female monkeys. Primate Record, **4:** 7–10.

———. 1977. Sundarban Forest—Bangladesh. Tigerpaper, **4**(2): 13–15.

———. 1978. Number 10,000 is gold. Primate News, **16:** 12.

———. 1980. The macaques on Hainan Island. China Reconstructs, **29**(5): 17.

———. 1985. Rhesus monkey boom. Oryx, **19:** 241–242.

ANTHONY, H. E. 1941. Mammals collected by the Ver-

nay-Cutting Burma Expedition. Zoological Series, Field Museum of Natural History, **27:** 37–123.

Arnold, D. L., and S. Hayward. 1998. [Response to letter of Dr. W. H. James.] Food and Chemical Toxicology, **36:** 451–453.

Arya, S. N. 1981. A new species of the genus *Probstmayria* Ranson, 1907 (Nematoda: Atractidae) from the rhesus macaque, *Macaca mulatta*. Primates, **22:** 261–265.

Audebert, J. B. [1799]. Seconde Famille, pp. 1–10. *In* Audebert, J. B., Histoire Naturelle des Singes et des Makis. Desray, Paris.

Bābur, Z. M. 1921. Memoirs of Zehir-ed-din Muhammed Bābur, Emperor of Hindustan, Volume 2. Oxford University Press, Oxford, 471 pp. Translated by J. Leyden and W. Erskine; annotated and revised by L. King.

Bailey, F. M. 1914. Exploration on the Tsangpo or upper Brahmaputra. Geographical Journal, **44:** 341–364. (map opposite p. 428)

———. 1915. Notes from southern Tibet. Journal of the Bombay Natural History Society, **24:** 72–78.

———. 1957. No Passport to Tibet. Travel Book Club, London, 294 pp.

Ball, J., and C. G. Hartman. 1935. Sexual excitability as related to the menstrual cycle in the monkey. American Journal of Obstetrics and Gynecology, **29:** 117–119.

Bangs, O., and J. Van Tyne. 1931. Birds of the Kelly-Roosevelts Expedition to French Indo-China. Zoological Series, Field Museum of Natural History, **18:** 33–119.

Bannikov, A. G. 1958. Tropical forest fauna in South-West China. Piroda (Nature), Academy of Sciences of the USSR, **10:** 67–70. (in Russian)

Barthélemy, P. F. S. 1904. Au Pays Moï. Plon-Nourrit, Paris, 255 pp.

Baulu, J. 1976. Seasonal sex skin coloration and hormonal fluctuations in free-ranging and captive monkeys. Hormones and Behavior, **7:** 481–494.

Berard, J. D. 1993. Male rank, mating success, and dispersal: A four-year study of mating patterns in free-ranging rhesus macaques. American Journal of Primatology, **30:** 298. (abstract only)

———. 1999. A four-year study of the association between male dominance rank, residency status, and reproductive activity in rhesus macaques (*Macaca mulatta*). Primates, **40:** 159–175.

Berard, J. D., P. Nürnberg, J. T. Epplen, and J. Schmidtke. 1993. Male rank, reproductive behavior, and reproductive success in free-ranging rhesus macaques. Primates, **34:** 481–489.

———. 1994. Alternative reproductive tactics and reproductive success in male rhesus macaques. Behavior, **129:** 177–201.

Berard, J. D., and J. Schmidtke. 1996. A longitudinal study of male reproductive success in rhesus macaques, abstract no. 459. Abstracts from the XVIth Congress of the International Primatological Society and the XIXth Conference of the American Society of Primatologists. Wisconsin Regional Primate Research Center, Madison, not paginated. (abstract only)

Bercovitch, F. B. 1992. Estradiol concentrations, fat deposits, and reproductive strategies in male rhesus macaques. Hormones and Behavior, **26:** 272–282.

———. 1997. Reproductive strategies of rhesus macaques. Primates, **38:** 247–263.

Bercovitch, F. B., and J. D. Berard. 1993. Life history costs and consequences of rapid reproductive maturation in female rhesus macaques. Behavioral Ecology and Sociobiology, **32:** 103–109.

Bercovitch, F. B., and R. W. Goy. 1990. The socioendocrinology of reproductive strategies in male rhesus macaques, pp. 59–93. *In* Ziegler, T. E., and F. B. Bercovitch, eds., Socioendocrinology of Primate Reproduction. Wiley-Liss, New York.

Bercovitch, F. B., M. R. Lebron, H. S. Martinez, and M. J. Kessler. 1998. Primagravidity, body weight, and costs of rearing first offspring in rhesus macaques. American Journal of Primatology, **46:** 135-144.

Bercovitch, F. B., and P. Nürnberg. 1996. Socioendocrine and morphological correlates of paternity in rhesus macaques (*Macaca mulatta*). Journal of Reproduction and Fertility, **107:** 59–68.

———. 1997. Genetic determination of paternity and variation in male reproductive success in two populations of rhesus macaques. Electrophoresis, **18:** 1701–1705.

Berenstain, L., P. S. Rodman, and D. G. Smith. 1981. Social relations between fathers and offspring in a captive group of rhesus monkeys (*Macaca mulatta*). Animal Behaviour, **29:** 1057–1063.

Berman, C. M. 1977. Seaside play is a serious business. New Scientist, **73:** 761–763.

———. 1988. Maternal condition and offspring sex ratio in a group of free-ranging rhesus monkeys: An eleven-year study. American Naturalist, **131:** 307–328.

Berman, C. M., K. L. Rasmussen, and S. J. Suomi. 1993. Reproductive consequences of maternal care patterns during estrus among free-ranging rhesus monkeys. Behavioral Ecology and Sociobiology, **32:** 391–399.

Berman, C. M., and R. G. Rawlins. 1985. Maternal dominance, sex ratio and fecundity in one social group on Cayo Santiago. American Journal of Primatology, **8:** 332. (abstract only)

Bernstein, I. S., T. E. Rueihlmann, P. G. Judge, T. Lindquist, and J. L. Weed. 1991. Testosterone changes during the period of adolescence in male rhesus monkeys (*Macaca mulatta*). American Journal of Primatology, **24:** 29–38.

Bernstein, I. S., J. L. Weed, P. G. Judge, and T. E. Ruehlmann. 1989. Seasonal weight changes in male rhesus monkeys (*Macaca mulatta*). American Journal of Primatology, **18:** 251–257.

Bhan, S. 1992. Development of mother-infant relationship in rhesus monkeys (*Macaca mulatta*) in natural habitats, pp. 163–175. *In* Seth, P. K., and S. Seth, eds., Perspectives in Primate Biology: Volume 4. Primates—the New Revolution. Today & Tomorrow's Printers and Publishers, New Delhi.

Bhargava, R. N. 1982. Primates in the Indian Desert (the Hanuman langur, *Presbytis entellus*, and the rhesus macaque, *Macaca mulatta*), p. 7. *In* Roonwal, M.

L., S. M. Mohnot, and N. S. Rathore, eds., International Symposium on Primates, Jodhpur: 17–20 February, 1982, Abstracts of Papers. Department of Zoology, University of Jodhpur, Jodhpur. (abstract only)

———. 1984. Primates in the Indian Desert (the Hanuman langur, *Presbytis entellus*, and the rhesus macaque, *Macaca mulatta*), pp. 41–45. *In* Roonwal, M. L., S. M. Mohnot, and N. S. Rathore, eds., Current Primate Researches. Department of Zoology, University of Jodhpur, Jodhpur.

Bhatia, A. K. 1978. Some angular age changes in the cranium of rhesus monkey (*Macaca mulatta*). Indian Journal of Physical Anthropology and Human Genetics, **4:** 65-68

Bielert, C., J. A. Czaja, S. Eisele, G. Scheffler, J. A. Robinson, and R. W. Goy. 1976. Mating in the rhesus monkey (*Macaca mulatta*) after conception and its relationship to oestradiol and progesterone levels throughout pregnancy. Journal of Reproduction & Fertility, **46:** 179–187.

Bielert, C., and J. G. Vandenbergh. 1981. Seasonal influences on births and male sex skin coloration in rhesus monkeys (*Macaca mulatta*) in the southern hemisphere. Journal of Reproduction & Fertility, **62:** 229–233.

Billet, A. 1896. Deux ans dans le Haut-Tonkin (Région de Cao-Bang). Bulletin Scientifique de la France et de la Belgique, **28:** 1–137.

Blackwelder, T. L., and M. S. Golub. 1996. Pubertal weight gain in female rhesus macaques. American Journal of Physical Anthropology, **99:** 449–454.

Blandau, R. J. 1973. Sperm transport through the mammalian cervix: Comparative aspects, pp. 285–303. *In* Blandau, R. J., and K. Moghissi, eds., The Biology of the Cervix. University of Chicago Press, Chicago.

Blanford, W. T. [1888a]. Critical notes on the nomenclature of Indian mammals. Proceedings of the Zoological Society of London, **1887:** 620–638. (For date of publication, see Duncan, F. M., 1937, Proceedings of the Zoological Society of London, series A, **107:** 74.)

———. 1888b. The Fauna of British India, Including Ceylon and Burma. Mammalia. Taylor and Francis, London, xx + 617 pp. (For date of publication, see Preface, p. iii.)

———. 1898. Notes on *Lepus oiostolus* and *L. pallipes* from Tibet, and on a Kashmir macaque. Proceedings of the Zoological Society of London, **1898:** 357–362.

Blyth, E. 1844. Notices of various mammalia, with descriptions of many new species. Journal of the Asiatic Society of Bengal, **13:** 463–494.

———. 1875. Catalogue of the mammals and birds of Burma. Journal of the Asiatic Society of Bengal, **44**(2), extra number: 1–64.

Boelkins, R. C., and A. P. Wilson. 1972. Intergroup social dynamics of the Cayo Santiago rhesus (*Macaca mulatta*) with special reference to changes in group membership by males. Primates, **13:** 125–139.

Bolton, K. A., V. M. Campbell, and F. D. Burton. 1998. Chemical analysis of soils of Kowloon (Hong Kong) eaten by hybrid macaques. Journal of Chemical Ecology, **24:** 195–205.

Bonvalot, G. 1891. Across Thibet. Cassel & Company, London, Vol. I, 218 pp.; Volume II, 221 pp. Translated by C. B. Pitman.

———. 1892. De Paris au Tonkin à Travers le Tibet Inconnu. Librairie Hachette et Ce., Paris, 507 pp.

Bonvalot, G., H. d'Orléans, and Père Dedéken. 1891. Traversée du Tibet. Bulletin de la Société de Géographie (Series 7), **2:** 328–350. (map following p. 404)

Boonratana, R., and C. J. Edwin. 1986. The development of mating relationships in a small group of *Macaca mulatta*. Primate Report, **14:** 110. (abstract only).

Borang, A., and G. S. Thapliyal. 1993. Natural distribution and ecological status of non-human primates in Arunachal Pradesh. Indian Forester, **119:** 834–844.

Bourne, G. H. 1975. Nutrition of the rhesus monkey, pp. 97–116. *In* Bourne, G. H., ed., The Rhesus Monkey, Volume II. Management, Reproduction, and Pathology. Academic Press, New York.

Bourne, G. H., and M. N. G. de Bourne. 1975. Breeding monkeys for biomedical research, pp. 261–276. *In* Bourne, G. H., ed., The Rhesus Monkey, Volume II. Management, Reproduction, and Pathology. Academic Press, New York.

Brandt, E., and G. Mitchell. 1971. Parturition in primates, pp. 177–223. In Rosenblum, L. A., ed., Primate Behavior: Developments in Field and Laboratory Research, Volume 2. Academic Press, New York.

Brennan, J., and J. R. Anderson. 1988. Varying responses to feeding competition in a group of rhesus monkeys (*Macaca mulatta*). Primates, **29:** 353–360.

Brereton, A. R. 1981. Intergroup consorting by a free-ranging female rhesus monkey (*Macaca mulatta*). Primates, **22:** 417–423.

Buchanan, F. 1934. An Account of the District of Shahabad in 1809–10. Bihar & Orissa Research Society, Patna, 444 pp. (posthumous publication)

———. [1936]. An Account of the Districts of Bihar and Patna in 1811–1812, Volume 2. Bihar & Orissa Research Society, Patna, 401–792 pp. (posthumous publication)

———. 1939. An Account of the District of Bhagalpur in 1810–11. Bihar & Orissa Research Society and Rai Bahadur Radha Krishna Jalan, Patna, 663 pp. (posthumous publication)

Buettner-Janusch, J. 1963. An introduction to the primates, pp. 1–64. *In* Buettner-Janusch, J., ed., Evolutionary and Genetic Biology of Primates, Volume I. Academic Press, 1963.

Buffon, G. L. L. de. 1789. Histoire Naturelle, Générale et Particulière, Servant de Suite à l'Histoire des Animaux Quadrupèdes, Supplément, Tome Septième. L'Imprimerie Royal, Paris, xx + 364 pp.

Burton, F. D., and L. Chan. 1996. Behavior of mixed species groups of macaques, pp. 389–412. *In* Fa, J. E., and D. G. Lindburg, eds., Evolution and ecology of macaque societies. Cambridge University Press, Cambridge.

Byrne, P. 1979. Exploring Nepal's Rivers. Explorers Journal, **57:** 68–73.

———. 1982. The Rara Expedition. Explorers Journal, **60:** 115–121.

Camperio Ciani, A. 1983. Ecologia e comportamento di *Macaca mulatta* a Simla (India): 1. Grooming e plas-

ticità sociale. Antropologia Contemporanea, **6:** 275–283.

———. 1984. A case of infanticide in a free-ranging group of rhesus monkeys (*Macaca mulatta*) in the Jackoo Forest, Simla, India. Primates, **25:** 372–377.

Cao Van Sung. 1995. Status of primate fauna and conservation in Vietnam, pp. 178–183. *In* Xia Wuping and Zhang Yongzu, eds., Primate Research and Conservation. China Forestry Publishing House, Beijing.

Carpenter, C. R. 1940. A field study in Siam of the behavior and social relations of the gibbon (*Hylobates lar*). Comparative Psychology Monographs, **16:** 1–212.

———. 1942a. Sexual behavior of free ranging rhesus monkeys (*Macaca mulatta*). I. Specimens, procedures and behavioral characteristics of estrus. Journal of Comparative Psychology, **33:** 113–142.

———. 1942b. Sexual behavior of free ranging rhesus monkeys (*Macaca mulatta*). II. Periodicity of estrus, homosexual, autoerotic and non-conformist behavior. Journal of Comparative Psychology, **33:** 143–162.

———. 1942c. Societies of monkeys and apes. Biological Symposia, **8:** 177–204.

Carter, T. D. 1943. The mammals of the Vernay-Hopwood Chindwin Expedition, northern Burma. Bulletin of the American Museum of Natural History, **82:** 95–113.

Casebolt, D.B., R. V. Henrickson, and D. W. Hird. 1985. Factors associated with birth rate and live birth rate in multi-male breeding groups of rhesus monkeys. American Journal of Primatology, **8:** 289–297.

Catchpole, H. R., and G. van Wagenen. 1975. Reproduction in the rhesus monkey, *Macaca mulatta*, pp. 117–140. In G. H. Bourne, ed., The Rhesus Monkey, Volume II. Management, Reproduction, and Pathology. Academic Press, New York.

Chalise, M. K. 1997. Monkeys from Makalu-Barun Conservation Area (MBCA). Nahson Bulletin. **7:** 30–34.

Chalise, M. K., and M. Ghimire. 1998. Non-human primate census in different parts of Nepal. Nahson Bulletin, **8:** 11–15.

Chambers, K. C., and C. H. Phoenix. 1992. Sexual behavior and serum levels of prolactin, testosterone, and estradiol in young and old rhesus males. Physiology and Behavior, **52:** 13–16.

Chambers, K. C., J. A. Resko, and C. H. Phoenix. 1982. Correlation of diurnal changes in hormones with sexual behavior and age in male rhesus macaques. Neurobiology of Aging, **3:** 37–42.

Champ, J. E., N. Binkley, T. Havighurst, R. J. Colman, J. W. Kemnitz, and E. B. Roecker. 1996. The effect of advancing age on bone mineral content of female rhesus monkeys. Bone, **19:** 485–492.

Champion, F. W. 1927. With a Camera in Tiger-land. Chatto & Windus, London, xviii + 228, pp.

———. 1929. Monkeys and Carnivora. Journal of the Bombay Natural History Society, **33:** 424.

———. 1934. The Jungle in Sunlight and Shadow. Charles Scribner's Sons, New York, xvi + 270 pp.

Champoux, M., C. L. Coe, S. M. Schanberg, C. M. Kuhn, and S. J. Suomi. 1989. Hormonal effects on early rearing conditions in the infant rhesus monkey. American Journal of Primatology, **19:** 111–117.

Champoux, M., J. D. Higley, and S. J. Suomi. 1997. Behavioral and physiological characteristics of Indian and Chinese-Indian hybrid rhesus macaque infants. Developmental Psychobiology, **31:** 49–63.

Champoux, M., M. F. Kriete, J. D. Higley, and S. J. Suomi. 1996. CBC and serum chemistry differences between Indian-derived and Chinese-Indian hybrid rhesus monkey infants. American Journal of Primatology, **37:** 79–84.

Champoux, M., S. J. Suomi, and M. L. Schneider. 1994. Temperament differences between captive Indian and Chinese-Indian hybrid rhesus macaque neonates. Laboratory Animal Science, **44:** 351–357.

Chance, M. R. A. 1956. Social structure of a colony of *Macaca mulatta*. British Journal of Animal Behaviour, **4:** 1–13.

Chandel, N. K. 1992. Dominance related visual attention toward adult male rhesus monkeys (*Macaca mulatta*) in free-ranging group, pp. 121–124. *In* Seth, P. K., and S. Seth, eds., Perspectives in Primate Biology: Volume 4. Primates—the New Revolution. Today & Tomorrow's Printers and Publishers, New Delhi.

Chang Chieh and Wang Tsung-yi. 1963. Faunistic studies of mammals of Chinghai Province. Acta Zoologica Sinica, **15:** 125–138. (in Chinese, English summary)

Chang Kwang-chih. 1986. The Archaeology of Ancient China. Yale University Press, New Haven, Connecticut, xxv + 450 pp.

Chapais, B. 1983. Reproductive activity in relation to male dominance and the likelihood of ovulation in rhesus monkeys. Behavioral Ecology and Sociobiology, **12:** 215–228.

Chapais, B., and S. R. Schulman. 1980. Alarm responses to raptors by rhesus monkeys at Cayo Santiago. Journal of Mammalogy, **61:** 739–741.

Chasen, F. N. 1935. On mammals from Siam. Journal of the Siam Society, Natural History Supplement, **10:** 31–57.

Chaturvedi, Y. [1973]. Observations on the fauna of Nagarjuna Sagar, Andhra Pradesh; with special reference to the mammals. Cheetal, **15:** 13–23. (For date of publication, see Newsletter of the Zoological Survey of India, 1976, **2:** 213.)

Chawla, K. K., C. D. S. Murthy, R. N. Chakravarti, and P. N. Chhuttani. 1967. Arteriosclerosis and thrombosis in wild rhesus monkeys. American Heart Journal, **73:** 85–91.

Chekiang Provincial Museum (Natural History Section). 1978. A study of the animal and plant remains unearthed at Ho-mu-tu. Acta Archaeologia Sinica, **1978:** 90–107. (in Chinese, English summary)

Chen Xiaohong, Zhang Yiming, Xue Deming, and Qu Wenyuan. 1998. Brief introduction on Taihang Mountain macaque's conservation and research work in Henan Province. Chinese Primate Research and Conservation News, **7:** 16–17, 25. (abstract only, in Chinese and English)

Chen, Z., P. Zhou, D. D. Ho, N. R. Landau, and P. A. Marx. 1997. Genetically divergent strains of simian

immunodeficiency virus use CCR5 as a coreceptor for entry. Journal of Virology, **71:** 2705–2714.

Chepko-Sade, B. D., and D. S. Sade. 1979. Patterns of group splitting within matrilineal kinship groups. A study of social group structure in *Macaca mulatta* (Cercopithecidae: Primates). Behavioral Ecology and Sociobiology, **5:** 67–86.

Chesemore, D. L. 1970. Notes on the mammals of southern Nepal. Journal of Mammalogy, **51:** 162–166.

Chetry, D., J. Bose, P. Sarkar, A. Srivastava, P. C. Bhattacharjee, and I. S. Bernstein. 1998. Primate status survey report on Western Assam Circle, India, abstract no. 249. Abstracts from the XVIIth Congress of the International Primatological Society. University of Antananarivo, Antananarivo, not paginated. (abstract only)

Cheverud, J. M. 1981. Epiphyseal union and dental eruption in *Macaca mulatta*. American Journal of Physical Anthropology, **56:** 157–168.

Cheverud, J. M., and J. T. Richtsmeier. 1986. Finite-element scaling applied to sexual dimorphism in rhesus macaque (*Macaca mulatta*) facial growth. Systematic Zoology, **35:** 381–399.

Chia L.-P. and Chang C.-P. 1977. The remains of animals found on the site of Hsia-wang-kang at Hsichuan County, Honan Province. Wen Wu (Cultural Relics), **1977:** 41–48. (in Chinese)

Chiarelli, A. B. 1972. Taxonomic Atlas of Living Primates. Academic Press, London, 362 pp.

Chock, A. K. 1963. J. F. Rock, 1884–1962. Taxon, **12:** 89–102.

Chopra, P. K., S. Seth, and P. K. Seth. 1992. Behavioural profile of free-ranging rhesus monkeys. Primate Report. **32:** 75–105.

Choudhury, A. 1983. Plea for a new wildlife refuge in eastern India. Tigerpaper, **10**(4): 12–15.

———. 1987. Railway threat to Kaziranga. Oryx, **21:** 160–163.

———. 1989. Phayre's leaf monkey (*Trachypithecus phayrei*) in Cachar. Journal of the Bombay Natural History Society, **85:** 485–492.

———. 1990. Primates in Bhutan. Oryx, **24:** 125.

———. [1991a]. Preliminary survey of the primates of Sibsagar, Assam. Primate Conservation, **9:** 31–34. (For date of publication, see Asian Primates, 1991, **1**[1]: 1.)

———. [1991b]. A primate survey in southern Assam, India. Primate Conservation, **9:** 123–125. (For date of publication, see Asian Primates, 1991, **1**[1]: 1.

———. 1994. Further observations on Phayre's leaf monkey (*Trachypithecus phayrei*) in Cachar, Assam. Journal of the Bombay Natural History Society, **91:** 203–210.

———. 1996. Primates in Assam—Status and conservation. Tigerpaper, **23**(3) : 14–17.

———. 1997. Primates in Bherjan, Borajan and Podumoni Reserved Forests of Assam, India. Asian Primates, **5**(3–4): 10–11.

———. 1998. A survey of primates in the Jaintia Hills. ASP Bulletin, **22**(3): 8–9.

Ciochon, R., J. Olsen, and J. James. 1990. Other Origins: The Search for the Giant Ape in Human Prehistory. Bantam Books, New York, xix + 262 pp.

Clarke, M. R., and J. A. S. O'Neil. 1999. Morphometric comparison of Chinese-origin and Indian-derived rhesus monkeys (*Macaca mulatta*). American Journal of Primatology, **47:** 335–346.

Clarke, M. R., and J. A. Snyder. 1996. Morphological comparison of Indian-origin rhesus monkeys and Chinese-origin rhesus monkeys (*Macaca mulatta*). American Journal of Physical Anthropology, Supplement **22:** 86: (abstract only)

Cochard, L. R. 1985. Ontogenetic allometry of the skull and dentition of the rhesus monkey (*Macaca mulatta*), pp. 231–255. *In* W. L. Jungers, ed., Size and Scaling in Primate Biology. Plenum Press, New York.

Coimbra-Filho, A. F., and A de A. Maia. 1977. As fases do processo reproductive de *Macaca mulatta* Zimmermann, 1780, na Ilha do Pinheiro, Rio de Janeiro, Brasil (Cercopithecidae, Primates). Revista Brasileira Biologia, **37:** 71–78.

Collings, M. R. 1926. A study of the cutaneous reddening and swelling about the genitalia of the monkey, *Macacus rhesus*. Anatomical Record, **33:** 271–287.

Colvin, J. 1983. Influences of the social situation on male emigration, pp. 160–171. *In* Hinde, R. A., ed., Primate Social Relationships: An Integrated Approach. Blackwell Scientific Publications, Oxford.

Conaway, C. H., and C. B. Koford. 1964. Estrous cycles and mating behavior in a free-ranging band of rhesus monkeys. Journal of Mammalogy, **45:** 577–588.

Cook, M., S. Mineka, B. Wolkenstein, and K. Laitsch. 1985. Observational conditioning of snake fear in unrelated rhesus monkeys. Journal of Abnormal Psychology, **94:** 591–610.

Coolidge, H. J., Jr. 1933. Remote Tonkin, pp. 49–102. *In* Coolidge, H. J., Jr., and T. Roosevelt, Three Kingdoms of Indo-China. Thomas Y. Crowell Company, New York.

———. 1940. Mammal and bird collections of the Asiatic Primate Expedition. Introduction. Bulletin of the Museum of Comparative Zoölogy at Harvard College, **87:** 121–130.

Corbet, G. B. 1992. Order Primates, pp. 161–186. *In* Corbet, G. B., and J. E. Hill, The Mammals of the Indomalayan Region: A Systematic Review. Natural History Museum Publications and Oxford University Press, Oxford. (For authorship, see p. 12.)

Corlett, R. T. 1996. Characteristics of vertebrate-dispersed fruits in Hong Kong. Journal of Tropical Ecology, **12:** 819–833.

Corner, G. W. 1923. Ovulation and menstruation in *Macacus rhesus*. Contributions to Embryology, **15:** 73–101.

Couzin, J. 1998. Low-calorie diets may slow monkey aging. Science, **282:** 1018.

Crovella, S., M. P. Bigatti, G. Ardito, M. Del Pero, D. Montagnon, and L. Lamberti. 1994. The high genetic homology of three *Macaca fascicularis* and two *Macaca mulatta* subspecies on the basis of their highly repeated DNA restriction patterns. Human Evolution, **9:** 63–71.

Cuc Ban Do-Bo Tong Tham Muu, Quan Doi Nhan Dan Viet Nam. 1980–88. [Map of Vietnam, 1: 250,000]. Da Lat.

Cupp, C. J., and E. Uemura. 1981. Body and organ weights in relation to age and sex in *Macaca mulatta*. Journal of Medical Primatology, **10:** 110–123.

Curie-Cohen, M., D. Yoshihara, L. Luttrell, K. Benforado, J. W. MacCluer, and W. H. Stone. 1983. The effects of dominance on mating behavior and paternity in a captive troop of rhesus monkeys (*Macaca mulatta*). American Journal of Primatology, **5:** 127–138.

Cuvier, F. 1819. Le Maimon ou Rhesus, Livraison 11, pp. 1–3. *In* Geoffroy Saint-Hilaire, É., and F. Cuvier, Histoire Naturelle des Mammifères, Volume 1. A. Belin, Paris. (For authorship, see Introduction, p. 8.)

Czaja, J. A., and C. Bielert. 1975. Female rhesus sexual behavior and distance to a male partner: Relation to stage of the menstrual cycle. Archives of Sexual Behavior, **4:** 583–597.

Czaja, J. A., S. G. Eisele, and R. W. Goy. 1975. Cyclical changes in the sexual skin of female rhesus: Relationships to mating behavior and successful artificial insemination. Federation Proceedings, **34:** 1680–1684.

Dahlbom, A. G. 1856. Studia Zoologica. . . , Volume 1., Fasc. 1. Berlingianis, Lund, 240 pp.

Dai Jiejie, Xie Jin, and He Zhanlong. 1998. Analysis on pathology in captive rh[e]sus mo[n]keys. Chinese Primate Research and Conservation News, **7:** 13, 30. (abstract only, in Chinese and English)

Dailey, R. A., and J. D. Neill. 1981. Seasonal variation in reproductive hormones of rhesus monkeys: Anovulatory and short luteal phase menstrual cycles. Biology of Reproduction, **25:** 560–567.

Dang Huy Huynh. 1983. A contribution to the ecology of *Macaca mulatta* in Vietnam. Zoologichesky Zhurnal, **62:** 1281–1284. (in Russian, English abstract)

Dang Huy Huynh, Dao Van Tien, Cao Van Sung, Pham Trong Anh, and Hoang Minh Khien. 1994. Checklist of Mammals in Vietnam. Science and Technics Publishing House, Hanoi, 167 pp. (in Vietnamese)

Dao Van Tien. 1960. Recherches zoologiques dans la région de Vinh-Linh (Province de Quang Tri, Centre Vietnam). Zoologischer Anzeiger, **164:** 221–239.

———. 1961. Recherches zoologiques dans la région de Thai-Nguêyn (Nord-Vietnam). Zoologischer Anzeiger, **166:** 298–308.

———. 1962. Materiaux sur la faune des vertébrés de Vietnam. Zoologichesky Zhurnal, **41:** 724–735. (in Russian, French summary)

———. 1978. Sur une collection de mammifères du Plateau de Moc Chau (Province de So'n-la, Nord-Vietnam). Mitteilungen aus dem Zoologischen Museum in Berlin, **54:** 377–391.

———. 1985. Scientific Results of Some Mammals Surveys in North Vietnam. Scientific and Technical Publishing House, Hanoi, 329 pp. (in Vietnamese, English summary)

Darlington, P. J. 1957. Zoogeography: The Geographical Distribution of Animals. John Wiley & Sons, New York, xi + 675 pp.

Darwin, C. 1871. The Descent of Man and Selection in Relation to Sex, Volume II. D. Appleton and Company, New York, 436 pp.

———. 1876. Sexual selection in relation to monkeys. Nature (London), **15:** 18–19.

Das, S. M., and B. D. Sharma. 1981. Observations on a remarkable association between rhesus monkey (*Macaca mulatta* villosa) and the Himalayan langur (*Presbytis entellus schistaceus*) in the Kumaun Himalayas, India. Journal of the Bombay Natural History Society, **77:** 496–497.

Datta, J. 1996. Observation on urban rhesus monkeys. Current Science, **71:** 941.

Daudin, F. M. 1802. Tableau des divisions, sous divisions, ordres et genres des mammifères, par le C^en^ Lacepède; avec l'indication de toutes les espèces décrites par Buffon, et leur distribution dans chacun des genres, par F. M. Daudin, pp. 143–195. *In* Buffon, G. L. L., Histoire Naturelle, par Buffon, Volume 14 (Quadrupèdes). P. Didot & Fèrmin Didot, Paris.

David, A. 1875. Journal de mon troisième voyage d'exploration dans l'empire Chinois. Hachette, Paris, Vol. 1, 383 pp., Volume 2, 348 pp.

Davis, R. T. 1985. The effects of aging on the behavior of rhesus monkeys, pp. 57–82. *In* Davis, R. T., and C. W. Leathers, eds., Behavior and Pathology of Aging in Rhesus Monkeys. Alan R. Liss, New York.

de Beaux, O. 1923. Contributo allo studio dei macachi. Atti della Societa Ligure di Scienze e Lettere, II, **1:** 22–39.

Debyser, I. W. J. 1995. Catarrhine juvenile mortality in captivity, under seminatural conditions, and in the wild. International Journal of Primatology, **16:** 935–969.

de Faaria, D. S., and R. F. Guerra. 1985. A colônia de *Macaca mulatta* Zimmermann, 1870, na Ilha do Pinheiro, Rio de Janeiro, Brasil: Fases do processo reproductivo nos anos de 1977 e 1978. Revista Brasileira de Biologia, **45:** 183–199.

Delacour, J. 1929. On the birds collected during the fourth expedition to French Indo-China. Ibis, 12th series, **5:** 193–220, 403–429.

———. 1940. Liste provisoire des mammifères de l'Indochine Francaise. Mammalia, **4:** 20–29.

Delacour, J., and P. Jabouille. 1927. Troisième expedition en Indochine. L'Oiseau, **8:** 299–311.

Delacour, J., P. Jabouille, and W. P. Lowe. 1927. Short report on the second expedition to French Indo-China. Ibis, 12th series, **3:** 132–134.

Delson, E. 1980. Fossil macaques, phyletic relationships and a scenario of deployment, pp. 10–30. *In* Lindburg, D. G., ed., The Macaques: Studies in Ecology, Behavior and Evolution. Van Nostrand Reinhold, New York.

de Poncins, E. 1935. A hunting trip in the Sunderbunds in 1892. Journal of the Bombay Natural History Society, **37:** 844–858.

DeRousseau, C. J. 1990. Variation in the growth and aging of rhesus monkeys, pp. 285–295. *In* De Rousseau, C. J., ed., Primate Life History and Evolution. Wiley-Liss, New York.

Desmarest, A. G. 1820. Mammalogie ou Description

des Espèces de Mammifères, pt. 1. Agasse, Paris, viii + 276 pp.

Deuve, J., and M. Deuve. 1963. Contribution à la connaissance des mammifères du Laos: Liste des espèces actuellment identifiées. Bulletin de la Société Royale des Sciences Naturelles du Laos, **8:** 49–62.

Di Chen. 1985. Suoxi Valley—Spectacular nature preserve. China Reconstructs, **34**(8): 30–33.

Dietz, J. M., A. J. Baker, and T. D. Allendorf. 1995. Correlates of molt in golden lion tamarins (*Leontopithecus rosalia*). American Journal of Primatology, **36**, 277–284.

Ding Bo, Zhang Ya-ping, and Hou Yi-di. 1998. Genetic diversity among *Macaca mulatta* from six regions in Yunnan Province based on protein electrophoresis. Zoological Research, **19:** 171–172. (in Chinese)

Disotell, T. R., R. L. Honeycutt, and M. Ruvolo. 1992. Mitochondrial DNA phylogeny of the Old-World monkey tribe Papionini. Molecular Biology and Evolution, **9:** 1–13.

Dixson, A. F., B. J. Everitt, J. Herbert, S. M. Rugman, and D. M. Scruton. 1973. Hormonal and other determinants of sexual attractiveness and receptivity in rhesus and talapoin monkeys, pp. 36–63. *In* Phoenix, C. H., ed., Primate Reproductive Behavior. S. Karger, Basel.

Dodsworth, P. T. L. 1914. Notes on some mammals found in the Simla District, the Simla Hills Estate, and Kalka and adjacent country. Journal of the Bombay Natural History Society, **22:** 726–748.

Dolan, Brooke, II. 1939. Zoological results of the Second Dolan Expedition to Western China and Eastern Tibet, 1934–1936. Part I.—Introduction. Proceedings of the Academy of Natural Sciences of Philadelphia, **90:** 159–184.

Dolinow, P., and D. C. Lindburg. 1980. A population survey of forest-dwelling rhesus monkeys (Primates: Cercopithecidae) in North India. Records of the Zoological Survey of India, **76:** 207–219.

d'Orleans, H. 1889. Six Mois aux Indes—Chasses aux Tigres. Calmann Lévy, Paris, 384 pp.

Dover, C. 1932. The duration of life of some Indian mammals. Journal of the Bombay Natural History Society, **36:** 244–250.

Drickamer, L. C. 1974a. Social rank, observability, and sexual behavior of rhesus monkeys (*Macaca mulatta*). Journal of Reproduction and Fertility, **37:** 117–120.

———. 1974b. A ten-year summary of reproductive data for free-ranging *Macaca mulatta*. Folia Primatologica, **21:** 61–80.

———. 1975. Patterns of space utilization and group interactions among free-ranging *Macaca mulatta*. Primates, **16:** 23–34.

Drickamer, L. C., and S. H. Vessey. 1974. Group changing in free-ranging male rhesus monkeys. Primates, **14:** 359–368.

Duan Xingsheng, Liu Yuanwei, Wu Jing, Dao Weiying, and Liu Jianghai. 1995. Investigation of serum antibody of the type D retrovirus of the rhesus monkey (*Macaca mulatta*), pp. 410–413. *In* Xia Wuping and Zhang Yongzu, eds., Primate Research and Conservation. China Forestry Publishing House, Beijing. (in Chinese, English summary)

Duckworth, J. W. 1996. Bird and mammal records from the Sangthong District, Vientiane Municipality, Laos, in 1996. Natural History Bulletin of the Siam Society, **44:** 217–242.

du Halde, J. B. 1735. Description Geographique, Historique, Chronologique, Politique, et Physique de l'Empire de la Chine et de la Tartarie Chinoise, Tome Premier. Chez P. G. Le Mercier, Imprimeur-Libraire, Paris, lii + iv + 592 pp.

Duvall, S. W., I. S. Bernstein, and T. P. Gordon. 1976. Paternity and status in a rhesus monkey group. Journal of Reproduction and Fertility, **47:** 25–31.

Dyke, B., T. B. Gage, P. M. Mamelka, R. W. Goy, and W. H. Stone. 1986. A demographic analysis of the Wisconsin Regional Primate Center rhesus colony. American Journal of Primatology, **10:** 257–269.

Eckstein, P. 1949. Age changes in dentition in the rhesus monkey. British Medical Association, Proceedings of the Annual Meeting, **1948:** 366–370.

Eckstein, P., and S. Zuckerman. 1956. Morphology of the reproductive tract, pp. 43–155. *In* Parkes, A. S., ed., Marshall's Physiology of Reproduction. Longmans, Green and Company, London.

Editors. 1989. The Yunnan National Laboratory Primate Center of China (YNLPC): An outline. Primates, **30:** 143–145.

Edwin, C. J., and S. R. K. Chopra. 1984. Group characteristics of *Macaca mulatta* inhabiting submontane and montane forests of the Indian subcontinent: A comparative review, pp. 307–313. *In* Roonwal, M. L., S. M. Mohnot, and N. S. Rathore, eds., Current Primate Researches. Department of Zoology, University of Jodhpur, Jodhpur.

Ellerman, J. R., and T. C. S. Morrison-Scott. 1951. Checklist of Palaearctic and Indian Mammals, 1758 to 1946. British Museum (Natural History), London, 810 pp.

Elliot, D. G. 1909. Descriptions of apparently new species and subspecies of monkeys of the genera *Callicebus*, *Lagothrix*, *Papio*, *Pithecus*. *Cercopithecus*, *Erythrocebus*, and *Presbytis*. Annals and Magazine of Natural History, 8th series, **4:** 244–274.

———. 1913. A Review of the Primates, Volume 2. American Museum of Natural History, New York, xviii + 382 + xxvi pp. (For date of publication, see Correction, between pp. ii and iii.)

Ellison, B. C. 1922. H. R. H. the Prince of Wales' shooting in India in 1921 and 1922—Part II. Journal of the Bombay Natural History Society, **28:** 1091–1106.

Elphinstone, M. 1842. An Account of the Kingdom of Caubul, and Its Dependencies. . . , Volume I. Richard Bentley, London, 422 pp.

Ely, J. J., G. S. Manis, M. E. Keeling, and W. H. Stone. 1994. Maintenance of genetic variability in a specific pathogen-free breeding colony. Laboratory Animal Science, **44:** 211–216.

Erffmeyer, E. S. 1982. The nocturnal behavior of caged rhesus monkeys (*Macaca mulatta*). Folia Primatologica, **38:** 240–249.

Erschler, W. B., C. L. Coe, S. Gravenstein, K. T. Schultz, R. G. Klopp, M. Meyer, and W. D. Houser. 1988. Aging and immunity in nonhuman primates: 1.

Effects of age and gender on cellular immune function in rhesus monkeys (*Macaca mulatta*). American Journal of Primatology, **15:** 181–188.

Erwin, J. 1974. Laboratory-reared rhesus monkeys can use their tails as tools. Perceptual and Motor Skills, **39:** 129–130.

Erxleben, J. C. P. 1777. Systema Regni Animalis per Classes, Ordines, Genera, Species, Varietates cum Synonymia et Historia Animalium. Classis I: Mammalia. Impensis Weygandianis, Lipsiae, 636 pp.

Eudey, A. A. 1979. Differentiation and dispersal of macaques (*Macaca* spp.) in Asia. Dissertation. Department of Anthropology, University of California, Davis, 241 pp.

Fa, J. E. 1989. The genus *Macaca*: A review of taxonomy and evolution. Mammal Review, **18:** 45–81.

Fang Baohua, Xu Xinjie, and Liu Bingxu. 1995. Rhesus monkeys in the Taihang Mountains, Henan, China, and captive breeding, pp. 355–358. *In* Xia Wuping and Zhang Yongzu, eds., Primate Research and Conservation. China Forestry Publishing House, Beijing. (in Chinese, English summary)

Feeroz, M. M., M. A. Islam, and M. Kabir. 1995. Status, distribution and conservation of non-human primates of Bangladesh. Kyoto University Overseas Research Report of Studies on Asian Non-Human Primates, *9:* 73–82.

Fellowes, J. R. 1992. The natural diet of Hong Kong macaques. Memoirs of the Hong Kong Natural History Society, **19:** 131–132.

Feng Min, Jiang Haisheng, and Wang Jun. 1997. Comparison among rhesus monkey populations in a scream. Acta Theriologica Sinica, **17:** 24–30. (in Chinese, English summary)

Feng Zuojian, Cai Guiquan, and Zheng Changlin. 1984. A checklist of the mammals of Xizang (Tibet). Acta Theriologica Sinica, **4:** 341–358. (in Chinese, English summary)

Fiedler, W. 1956. Übersicht über das System der Primates, pp. 1–266. *In* Hofer, H., A. H. Schultz, and D. Starck, eds., Primatologia, Volume I. Systematik, Phylogenie, Ontogenie. S. Karger, Basel.

Fischer, J. B. 1829. Synopsis Mammalium. J. G. Cotta, Stuttgart, xlii + 527 pp.

Fisler, G. F. 1967. Nonbreeding activities of three adult males in a band of free-ranging rhesus monkeys. Journal of Mammalogy, **48:** 70–78.

Fleischman, R. W. 1963. The care of infant rhesus monkeys (*Macaca mulatta*). Laboratory Animal Care, **13:** 703–710.

Flower, S. S. 1931. Contributions to our knowledge of the duration of life in vertebrate animals.—V. Mammals. Proceedings of the Zoological Society of London, **1931:** 145–234.

Fooden, J. 1969. Taxonomy and evolution of the monkeys of Celebes (Primates: Cercopithecidae). Bibliotheca Primatologica, **10:** 1–148.

———. 1971. Report on primates collected in western Thailand January-April, 1967. Fieldiana: Zoology, **59:** 1–62.

———. 1980. Classification and distribution of living macaques (*Macaca* Lacépède, 1799), pp. 1–9. *In* Lindburg, D. G., ed., The Macaques: Studies in Ecology, Behavior and Evolution. Van Nostrand Reinhold, New York.

———. 1981. Taxonomy and evolution of the *sinica* group of macaques: 2. Species and subspecies accounts of the Indian bonnet macaque, *Macaca radiata*. Fieldiana: Zoology, new series, **9:** 1–52.

———. 1982a. Taxonomy and evolution of the *sinica* group of macaques: 3. Species and subspecies accounts of *Macaca assamensis*. Fieldiana: Zoology, new series, **10:** 1–52.

———. 1982b. Ecogeographic segregation of macaque species. Primates, **23:** 574–579.

———. 1983. Taxonomy and evolution of the *sinica* group of macaques: 4. Species account of *Macaca thibetana*. Fieldiana: Zoology, new series, **17:** 1–20.

———. 1988. Taxonomy and evolution of the *sinica* group of macaques: 6. Interspecific comparisons and synthesis. Fieldiana: Zoology, new series, **45:** 1–44.

———. 1989. Classification, distribution and ecology of Indian macaques, pp. 33–46. *In* Seth, P. K., and S. Seth, eds., Perspectives in Primate Biology: Volume 2. Today & Tomorrow's Printers and Publishers. New Delhi.

———. 1994. Malaria in macaques. International Journal of Primatology, **15:** 573–596.

———. 1995. Systematic review of Southeast Asian longtail macaques, *Macaca fascicularis* (Raffles, [1821]). Fieldiana: Zoology, new series, **81:** 1–206.

———. 1996. Zoogeography of Vietnamese Primates. International Journal of Primatology, **17:** 845–899.

———. 1997. Tail length variation in *Macaca fascicularis* and *M. mulatta*. Primates, **38:** 221–231.

Fooden, J., and G. H. Albrecht. 1999. Tail-length evolution in *fascicularis*-group macaques (Cercopithecidae: *Macaca*). International Journal of Primatology, **20:** 431–440.

Fooden, J., and S. M. Lanyon. 1989. Blood-protein allele frequencies and phylogenetic relationships in *Macaca*: A review. American Journal of Primatology, **17:** 209–241.

Fooden, J., A. Mahabal, and S. S. Saha. 1981. Redefinition of rhesus macaque-bonnet macaque boundary in peninsular India (Primates: *Macaca mulatta*, *M. radiata*). Journal of the Bombay Natural History Society, **78:** 463–474.

Fooden, J., Quan Guoqiang, Zhang Yongzu, Wu Mingchuan, and Liang Monyuan. 1994. Southward extension of the range of *Macaca thibetana*. International Journal of Primatology, **15:** 623–627.

Freedman, L. Z., and H. E. Rosvold. 1962. Sexual, aggressive and anxious behavior in the laboratory macaque. Journal of Nervous and Mental Disease, **134:** 18–27.

Fry, T. B. 1928. Bombay Natural History Society's Mammal Survey of India, Burma and Ceylon. Report No. 46: On a collection from Toungoo, Burma. Journal of the Bombay Natural History Society, **32:** 545–547.

———. 1929. Bombay Natural History Society's Mammal Survey of India, Burmah and Ceylon. Report No. 46 (Supplementary): On the second, third and fourth

collections from Toungoo, Burmah., made by Mr. J. M. D. Mackenzie, I. F. S., between dates February 9, 1927 to March 2, 1928. Journal of the Bombay Natural History Society, **33:** 636–652.

Fu Ting-zhang. 1987. Notes on the Nan-Ling mammals. Chinese Journal of Zoology, **22:** 36–38. (in Chinese)

Fulton, H. 1903. Rough notes on the Mammalia of Chitral. Journal of the Bombay Natural History Society, **14:** 758–760.

Furuya, Y. 1962. Studies on the dermatoglyphics of the macaques. Proceedings of the Japan Academy. **38:** 377–386.

Gagnepain, F. 1944. Introduction, pp. 1–89. *In* Lecomte, H., H. Humbert, and F. Gagnepain, eds., Flore Générale l'Indo-Chine, Volume 1. Masson et Cie, Paris.

Gaston, A. J., P. J. Garson, and M. L. Hunter, Jr. 1983. The status and conservation of forest wildlife in Himachal Pradesh, western Himalayas. Biological Conservation, **27:** 291–314.

Gavan, J. A. 1967. Eruption of primate deciduous dentition: A comparative study. Journal of Dental Research, *46* (Supplement to No. 5): 984–988.

———. 1991. Postnatal growth in two species of macaques. American Journal of Human Biology, **3:** 581–586.

Gavan, J. A., and T. C. Hutchinson. 1973. The problem of age estimation: A study using rhesus monkeys (*Macaca mulatta*). American Journal of Physical Anthropology, **38:** 69–81.

Gee, E. P. 1961. The distribution and feeding habits of the golden langur, *Presbytis geei* Gee (Khajuria, 1956). Journal of the Bombay Natural History Society, **58:** 1–12.

———. 1975. The Wild Life of India, 2nd edition. Collins, London. 192 pp.

Geissmann, T. 1990. Twinning frequency in catarrhine primates. Human Evolution, **5:** 387–396.

Gelvin, B. R., and G. H. Albrecht. 1996. Latitudinal size variation in Hanuman langurs (*Presbytis entellus*). American Journal of Physical Anthropology, **Supplement 22:** 111. (abstract only)

Geoffroy Saint-Hilaire, É. 1803. Catalogue des Mammifères du Muséum National d'Histoire Naturelle. Muséum National d'Histoire Naturelle, Paris. 272 pp.

———. 1812. Tableau des quadrumanes, ou des animaux composant le premier ordre de la classe des mammifères. Annales de Muséum d'Histoire Naturelle, **19:** 85–122.

Geoffroy Saint-Hilaire, I. 1826. Macaque, pp. 584–590. *In* Bory de Saint-Vincent, ed., Dictionnaire Classique d'Histoire Naturelle, Volume 9. Rey et Gravier and Baudouin Frères, Paris.

Ghosh, A. K., and S. Biswas. 1977. A preliminary report on wildlife in "Balphakram," a proposed sanctuary in Meghalaya, India. Tigerpaper, **4**(1): 24–25.

Giant Panda Expedition of the Wanglang Natural Reserve. 1974. A survey on the giant panda (*Ailuropoda melanoleuca*) in Wanglang Natural Reserve, Pingwu, northern Szechuan, China. Acta Zoologica Sinica, **20:** 162–173. (in Chinese, English summary)

Gibber, J. R. 1986. Infant-directed behavior of rhesus monkeys during their first pregnancy and parturition. Folia Primatologica, **46:** 118–124.

Gilardi, K. V. K., S. E. Shideler, C. R. Valverde, J. A. Roberts, and B. L. Lasley. 1997. Characterization of the onset of menopause in the rhesus macaque. Biology of Reproduction, **57:** 335-340

Gill, P. S., J. Blangero, G. S. Manis, J. Scheffler, M. E. Keeling, and W. H. Stone. 1992. Genetic structure of three populations of rhesus macaques (*Macaca mulatta*): Implications for genetic management. American Journal of Primatology, **27:** 85–92.

Gill, W. 1883. The River of Golden Sand: Being the Narrative of a Journey through China and Eastern Tibet to Burmah. John Murray, London, 332 pp.

Gittins, S. P., and A. W. Akonda. 1982. What survives in Bangladesh? Oryx, **16:** 275–281.

Głąb, H., and K. Szostek. 1996. Variability of trace element contents in permanent teeth of *Macaca mulatta*—Two different populations. Folia Primatologica, **64:** 215–217.

Goldfuss, G. A. 1809. Vergleichende Naturbeschriebung der Säugethiere. Verlag der Waltherschen Kunst- und Buchhandlung, Erlangen, xx + 316 pp.

Goldstein, S. J., and A. F. Richard. 1989. Ecology of rhesus macaques (*Macaca mulatta*) in Northwest Pakistan. International Journal of Primatology, **10:** 531–567.

Gomendio, M. 1989. Suckling behaviour and fertility in rhesus macaques (*Macaca mulatta*). Journal of Zoology, London, **217:** 449–467.

———. 1990. The influence of maternal rank and infant sex on maternal investment trends in rhesus macaques: Birth sex ratios, inter-birth intervals and suckling patterns. Behavioral Ecology and Sociobiology, **27:** 365–375.

Goo, G. P. 1986. Primate colony management of harem breeding groups of rhesus monkeys (*Macaca mulatta*), pp. 71–78. *In* Taub, D. M., and F. A. King, eds., Current Perspectives in Primate Biology. Van Nostrand Reinhold Co., New York.

Goo, G. P., and J. K. Fugate. 1984. Effects of weaning age on maternal reproduction and offspring health in rhesus monkeys (*Macaca mulatta*). Laboratory Animal Science, **34:** 66–69.

Goodyer, N. J. 1992. Notes on the land mammals of Hong Kong. Memoirs of the Hong Kong Natural History Society, **19:** 71–78.

Gordon, T. P., and I. S. Bernstein. 1973. Seasonal variation in sexual behavior of all-male rhesus troops. American Journal of Physical Anthropology, **38:** 221–225.

Gordon, T. P., I. S. Bernstein, and R. Rose. 1978. Social and seasonal influences on testosterone secretion in the male rhesus monkey. Physiology and Behavior, **21:** 623–627.

Gordon, T. P., R. M. Rose, and I. S. Bernstein. 1976. Seasonal rhythm in plasma testosterone levels in the rhesus monkey (*Macaca mulatta*): A three year study. Hormones and Behavior, **7:** 229–243.

Goy, R. W., W. E. Bridson, and J. A. Robinson. 1982. Puberty in the rhesus male. International Journal of Primatology, **3:** 288. (abstract only)

Graham, D. G. 1926–29. A collecting trip to Washan and Mount Omei. Journal of the West China Border Research Society, **3:** 30–31.

Gray, J. E. 1843. List of the Specimens of Mammalia in the Collection of the British Museum. Trustees [of the British Museum], London, xx + 216 pp.

———. 1846. Catalogue of the Specimens and Drawings of Mammalia and Birds of Nepal and Thibet presented by B. H. Hodgson, Esq. to the British Museum. Trustees [of the British Museum], London, xi + 156 pp.

———. 1868. Notice of *Macacus lasiotus*, a new species of ape from China, in the collection of the Society. Proceedings of the Zoological Society of London, **1868:** 60–61.

Green, K. M. 1978. Primates of Bangladesh: A preliminary survey of population and habitat. Biological Conservation, **13:** 141–160.

Gribnau, A. A. M., and L. G. M. Geijsberts. 1981. Developmental Stages in the Rhesus Monkey (*Macaca mulatta*). Springer-Verlag, Berlin, 84 pp.

Gu Yumin, Huang Wanbo, Chen Dayuan, Guo Xinfu, and N. G. Jablonski. 1996. Pleistocene fossil primates from Luoding, Guangdong. Vertebrata PalAsiatica, **34:** 235–250. (in Chinese, English summary)

Gupta, A. K. 1994. Status and conservation of non-human primates in Tripura, India, pp. 101–111. *In* Thierry, B., J. R. Anderson, J. J. Roeder, and N. Herrenschmidt, eds., Current Primatology. Volume I: Ecology and Evolution. Université Louis Pasteur, Strasbourg.

Gupta, R. C., and S. Kumar. 1992. The feeding habits of free-ranging rhesus monkey *Macaca mulatta* (Zimmermann). Geobios, **19:** 226–230.

Gurung, K. K., and R. Singh. 1996. Field Guide to the Mammals of the Indian Subcontinent. Academic Press, San Diego, xii + 140 pp.

Hadidian, J., and I. S. Bernstein. 1979. Female reproductive cycles and birth data from an Old World monkey colony. Primates, **20:** 429–442.

Hallgrímsson, B. 1999. Ontogenetic patterning of skeletal fluctuating asymmetry in rhesus macaques and humans: Evolutionary and developmental implications. International Journal of Primatology, **20:** 121–151.

Han Defen. 1988. The fauna from the Neolithic site of Hemudu, Zhejiang, pp. 868–872. *In* Whyte, P., J. A. Aigner, N. G. Jablonski, G. Taylor, and Wang Pinxian, eds., The Palaeoenvironment of East Asia from the Mid-Tertiary, Volume 2. Centre of Asian Studies, University of Hong Kong, Hong Kong.

Harlow, H. 1965. Sexual behavior in the rhesus monkey, pp. 234–265. *In* Beach, F. A., ed., Sex and Behavior. Wiley, New York.

Harrer, H. 1982. Seven Years in Tibet. J. P. Tarcher, Los Angeles, 321 pp. Translated from the German original, published in 1953.

Harrison, R. M. 1980. Semen parameters in *Macaca mulatta*: Ejaculates from random and selected monkeys. Journal of Medical Primatology, **9:** 265–273.

Hartman, C. G. 1928a. The period of gestation in the monkey, *Macacus rhesus*. Science, **67:** 15.

———. 1928b. Gestation in a monkey (*Macacus rhesus*) and associated phenomena. American Journal of Obstetrics and Gynecology, **15:** 535–540.

———. 1928c. The period of gestation in the monkey, *Macacus rhesus*, first description of parturition in monkeys, size and behavior of the young, Journal of Mammalogy, **9:** 181–194.

———. 1929. Uterine bleeding as an early sign of pregnancy in the monkey (*Macacus rhesus*), together with observations on the fertile period of the menstrual cycle. Bulletin of the Johns Hopkins Hospital, **44:** 155–164.

———. 1931. The breeding season in monkeys, with special reference to *Pithecus* (*Macacus*) *rhesus*. Journal of Mammalogy, *12:* 129–142.

———. 1932. Studies in the reproduction of the monkey (*Macaca Pithecus rhesus*) with special reference to menstruation and pregnancy. Contributions to Embryology, **23:** 1–161.

Hassinger, J. D. 1968. Introduction to the mammal survey of the 1965 Street Expedition to Afghanistan. Fieldiana: Zoology, **55:** 1–81.

Hausfater, G. 1972. Intergroup behavior of free-ranging rhesus monkeys (*Macaca mulatta*). Folia Primatologica, **18:** 78–107.

Hayasaka, K., K. Fujii, and S. Horai. 1996. Molecular phylogeny of Macaques: Implications of nucleotide sequences from an 896-base pair region of mitochondrial DNA. Molecular Biology and Evolution, **13:** 1044–1053.

Hayasaka, K., S. Horai, T. Gojobori, T. Shotake, K. Nozawa, and E. Matsunaga. 1988. Phylogenetic relationships among Japanese, rhesus, Formosan, and crab-eating monkeys, inferred from restriction-enzyme analysis of mitochondrial DNAs. Molecular Biology and Evolution, **5:** 270–281.

Heape, W. 1894. The menstruation of *Semnopithecus entellus*. Philosophical Transactions of the Royal Society of London. Series B, **185:** 411-471.

———. 1896. The menstruation and ovulation of *Macacus rhesus*. Proceedings of the Royal Society of London, **60:** 202–205.

———. 1897. The menstruation and ovulation of *Macacus rhesus*, with observations on the changes undergone by the discharged follicle. Philosophical Transactions of the Royal Society of London. Series B, **188:** 135–166.

Henderson, E., Z. Binienda, and M. G. Paule. 1993. Estimating maintenance feeding requirements for individually housed rhesus monkeys. Contemporary Topics in Laboratory Animal Science, **32:** 10–11.

Hendrichs, H. 1975. The status of the tiger *Panthera tigris* (Linné, 1758) in the Sunderbans mangrove forest. Säugetierkundliche Mitteilungen, **23:** 161–199.

Henshaw, S. 1912. Some Chinese Vertebrates: Introduction. Memoirs of the Museum of Comparative Zoölogy at Harvard College, **40:** 107–110.

Herklots, G. A. C. 1951. The Hong Kong Countryside. South China Morning Post, Hong Kong, 175 + vii pp.

Herndon, J. G., M.-C. Ruiz de Elvira, and J. J. Turner. 1986. Influence of female behaviour and endocrine status on sexual initiation in rhesus monkey groups. Primate Report, **14:** 95. (abstract only)

Herndon, J. G., M.-C. Ruiz de Elvira, J. J. Turner, and D. C. Collins. 1985. Resumption of seasonal breeding patterns in male and female rhesus monkeys transferred from an indoor to an outdoor environment. Biology of Reproduction, **32:** 733–744.

Higley, J. D., W. D. Hopkins, R. M. Hirsch, L. M. Marra, and S. J. Suomi. 1987. Preferences of female rhesus monkeys (*Macaca mulatta*) for infantile coloration. Developmental Psychobiology, **20:** 7–18.

Hill, D. A. 1987. Social relationships between adult male and female rhesus macaques: 1. Sexual consortships. Primates, **28:** 439–456.

Hill, W. C. O. 1974. Primates: Comparative Anatomy and Taxonomy. VII. Cynopithecinae: *Cercocebus*, *Macaca*, *Cynopithecus*. John Wiley & Sons, New York, xxi + 934 pp.

Hinde, R. A., and T. E. Rowell. 1962. Communication by postures and facial expressions in the rhesus monkeys (*Macaca mulatta*). Proceedings of the Zoological Society of London, **138:** 1–21.

Hinde, R. A., T. E. Rowell, and Y. Spencer-Booth. 1964. Behaviour of socially living rhesus monkeys in their first six months. Proceedings of the Zoological Society of London, **143:** 609–649.

Hingston, R. W. G. [1920]. A Naturalist in Himalaya. Small, Maynard & Company, Boston, xii + 300 pp.

Hinton, M. A. C., and T. B. Fry. 1923. Bombay Natural History Society's Mammal Survey of India, Burma and Ceylon. Report No. 37, Nepal. Journal of the Bombay Natural History Society, **29:** 399–428.

Hinton, M. A. C., and H. M. Lindsay. 1926. Bombay Natural History Society's Mammal Survey of India, Burma and Ceylon. Report No. 41, Assam and Mishmi Hills. Journal of the Bombay Natural History Society, **31:** 383–403

Hinton, M. A. C., and R. C. Wroughton. 1921. The synonymies, characters and distribution of the macaques included under the names *rhesus* and *assamensis* in Blanford's Mammals. Journal of the Bombay Natural History Society, **27:** 664–672.

Ho, H. J. 1935. Study of some mammals from Szechuan. Contributions from the Biological Laboratory of the Science Society of China, Zoological Series, **11:** 123–164.

Hodgen, G. D., A. L. Goodman, A. O'Connor, and D. K. Johnson. 1977. Menopause in rhesus monkeys: Model for study of disorders in the human climacteric. American Journal of Obstetrics and Gynecology, **127:** 581–584.

Hodgson, B. H. 1834. On the Mammalia of Nepaul. Proceedings of the Zoological Society of London, **1834:** 95–99.

———. 1841. Three new species of monkey; with remarks on the genera *Semnopithecus* et *Macacus*. Journal of the Asiatic Society of Bengal, **9:** 1211–1213. (For date of publication, see p. 1213.)

Hoelzer, G. A. 1997. Inferring phylogenies from mtDNA variation: Mitochondrial-gene trees versus nuclear-gene trees revisited. Evolution, **51:** 622–626.

Hoelzer, G. A., J. Wallman, and D. J. Melnick. 1998. The effects of social structure, geographical structure, and population size on the evolution of mitochondrial DNA: II. Molecular clocks and the lineage sorting period. Journal of Molecular Evolution, **47:** 21–31.

Horsfield, T. [1840]. List of Mammalia and birds collected in Assam by John McClelland. . . Proceedings of the Zoological Society of London, **1839:** 146–167. (For date of publication, see Duncan, F. M., 1937, Proceedings of the Zoological Society of London, **107**, Series A: 72.)

Howell, A. B. 1929. Mammals from China in the collection of the United States National Museum. Proceedings of the United States National Museum, **75:** 1–82.

Huang Wan-po, and Chi Hung-giang. 1963. Note on Holocene Hsienjen Cave deposit of Wannian, Kiangsi. Vertebrata PalAsiatica, **7:** 263–272.

Hudson, J. C., S. T. Baum, D. M. D. Frye, E. B. Roecker, and J. W. Kemnitz. 1996. Age and sex differences in body size and composition during rhesus monkey adulthood. Aging: Clinical and Experimental Research, **8:** 197–204

Hutton, T. 1837. Journal of a trip to the Burenda Pass in 1836. Journal of the Asiatic Society of Bengal, **6:** 901–938.

———. 1865. Notes and queries, zoology, no. 1. Journal of the Asiatic Society of Bengal, **33:** xiii. (For date of publication, see p. vi.)

Hurme, V. O. 1960. Estimation of monkey age by dental formula. Annals of the New York Academy of Sciences, **85:** 795–799.

Hurme, V. O., and G. van Wagenen. 1953. Basic data on the emergence of deciduous teeth in the monkey (*Macaca mulatta*). Proceedings of the American Philosophical Society, **97:** 291–315.

———. 1961. Basic data on the emergence of permanent teeth in the rhesus monkey (*Macaca mulatta*). Proceedings of the American Philosophical Society, **105:** 105-140.

Igbal, Q. J., and A. Rub. 1980. Sexual behaviour of free-ranging rhesus monkeys, *Macaca mulatta*. Antropologia Contemporanea, **3:** 214. (abstract only)

Imam, E., and H. S. A. Yahya. 1995. Population dynamics and distribution of rhesus monkey (*Macaca mulatta*) in Aligarh District, Uttar Pradesh. Journal of Ecobiology, **7:** 1–9.

Inagaki, H., and H. Nigi. 1988. Annual changes in hair length of the Japanese monkey (*Macaca fuscata fuscata*). Primates, **29:** 81–89.

International Code of Zoological Nomenclature, 3rd edition. 1985. International Trust for Zoological Nomenclature, London, xx + 338 pp.

Ishida, T., and P. Varavudhi. 1992. Wild long-tailed macaques (*Macaca fascicularis*) in Thailand are highly infected with gamma herpes virus but not with simian T-lymphotropic retrovirus of type 1. Folia Primatologica, **59:** 163–168.

Ishida, T., K. Yamamoto, G. Ishimoto, T. Shotake, O. Takenaka, K. Nozawa, M. Hayami, and Y. Hinuma. 1985. A field study of infection with human T-cell leukemia virus among Asian primates. Microbiology and Immunology, **29:** 839–846.

Islam, M. A., and K. Z. Husain. 1982. A preliminary study on the ecology of the capped langur. Folia Primatologica, **39:** 145–159.

Israel, O. 1919. Die Stötznersche Szetschwan-Expedition. Dr. A. Petermanns Mitteilungen aus Justus Perthes' Geographischer Anstalt, **65:** 57–100. (plates 7–10)

Iyer, K. B. 1977. Animals in Indian Sculpture. Taraporevala, Bombay, xv + 91 pp.

Jablonski, N. G. 1990. A brief report on the fossil record of nonhuman primates in China. Primate Report, **26:** 29–44.

Jablonski, N. G., and Gu Yumin. 1996. A diverse anthropoid fauna of probably Late Pleistocene age from Luoding, Guangdong, P. R. China. American Journal of Physical Anthropology, Supplement **22:** 130. (abstract only)

Jablonski, N. G., and Pan Yuerong. 1988. The evolution and palaeobiogeography of monkeys in China, pp. 849–867. *In* Whyte, P., J. A. Aigner, N. G. Jablonski, G. Taylor, and Wang Pinxian, eds., The Palaeoenvironment of East Asia from the Mid-Tertiary, Volume 2. Centre of Asian Studies, University of Hong Kong, Hong Kong.

Jablonski, N. G., Pan Yuerong, and Zhang Xinyong. 1994. New cercopithecid fossils from Yunnan Province, People's Republic of China, pp. 303–311. *In* Thierry, B., J. R. Anderson, J. J. Roeder, and N. Herrenschmidt, eds., Current Primatology. Volume I: Ecology and Evolution. Université Louis Pasteur, Strasbourg.

Jacobi, A. 1923. Zoologische Ergebnisse der Walter Stotznerschen Expeditionen nach Szetschwan, Osttibet und Tschili auf Grund der Sammlungen und Beobachtungen Dr. Hugo Weigolds. 1. Säugetiere. Abhandlungen und Berichte der Museen für Tierkunde und Völkerkunde zu Dresden, **16:** 1–22.

Jay, P. 1963. The Social Behavior of the Langur Monkey. Dissertation. Department of Anthropology, University of Chicago. Chicago, 360 pp.

———. 1965. The common langur of North India, pp. 197–249. *In* DeVore, I., ed., Primate Behavior. Holt, Rinehart and Winston, New York.

Jebavý, L., V. Struhár, V. Vančata, and M. Vančatová. 1994. Reproduction and sexual behaviour of captive colony of rhesus macaques in the Konárovice Primate Center—1984–1994 study. Anthropologie, **32:** 201–204.

Jiang Haisheng, Lian Jiansheng, Feng Min, Wang Jun, and Li Yahong. 1998. Studies on population growth of *Macaca mulatta* at Nanwan, Hainan. Acta Theriologica Sinica, **18:** 100–106. (in Chinese, English summary)

Jiang Haisheng, Lian Jiansheng, Wang Jun, Liu Zhenhe, and Feng Min. 1995. Influence of population growth stress on distribution of macaque monkey in South China. Chinese Journal of Applied Ecology, **6:** 176–181. (in Chinese, English summary)

Jiang Haisheng, Liu Zhenhe, Yuan Xicai, and Wang Hansheng. 1988a. Study on the reproduction of rhesus monkey in nature at Nanwan Peninsula, Hainan Island. Acta Theriologica Sinica, **8:** 105–112. (in Chinese, English summary)

———. 1988b. Activity habits of rhesus monkeys at Nanwan Peninsula of Hainan Island. Acta Theriologica Sinica, **8:** 294–298. (in Chinese, English summary)

Jiang Haisheng, Liu Zhenhe, Zhang Yongzu, and C. H. Southwick. 1991. Population ecology of rhesus monkeys (*Macaca mulatta*) at Nanwan Nature Reserve, Hainan, China. American Journal of Primatology, **25:** 207–217.

Jiang Haisheng, Wang Jun, and Liu Zhenhe. 1994. Influence of tourism on rhesus monkey (*Macaca mulatta*) population increasing at Nanwan Reserve. Acta Theriologica Sinica, **14:** 166–171. (in Chinese, English summary)

Jiang Xuelong, Wang Yingxiang, and Chen Zhiping. 1995. Discussion of taxonomy and distribution of some subspecies of rhesus monkey in China, pp. 43–49. *In* Xia Wuping and Zhang Yongzu, eds., Primate Research and Conservation. China Forestry Publishing House, Beijing. (in Chinese, English summary)

Jiang Xuelong, Wang Yingxiang, and Ma Shilai. 1991. Taxonomic revision and distribution of subspecies of rhesus monkey (*Macaca mulatta*) in China. Zoological Research, **12:** 241–247. (in Chinese, English summary)

Joag, S. V., E. B. Stephens, R. J. Adams, L. Foresman, and O. Narayan. 1994. Pathogenesis of SIV_{mac} infection in Chinese and Indian rhesus macaques: Effects of splenectomy on virus burden. Virology, **200:** 436–446.

Johnsingh, A. J. T., and J. Joshua. 1994. Conserving Rajaji and Corbett National Parks—The elephant as a flagship species. Oryx, **28:** 135–140.

Johnson, D. F., and C. Phoenix. 1978. Sexual behavior and hormone levels during the menstrual cycles of rhesus monkeys. Hormones and Behavior, **11:** 164–174.

Johnson, R. L. 1986. Mother-infant contact and maternal maintenance activities among free-ranging rhesus monkeys. Primates, **27:** 191–203.

Johnson, R. L., C. M. Berman, and I. Malik. 1993. An integrative model of the lactational and environmental control of mating in female rhesus monkeys. Animal Behaviour, **46:** 63–78.

Johnson, R. L., and E. Kapsalis. 1995a. Determinants of postnatal weight in infant rhesus monkeys: Implications for the study of interindividual differences in neonatal growth. American Journal of Physical Anthropology, **98:** 343–353.

———. 1995b. Ageing, infecundity and reproductive senescence in free-ranging female rhesus monkeys. Journal of Reproduction and Fertility, **105:** 271–278.

———. 1996. Is it likely that a rhesus female will experience menopause?, abstract no. 233. Abstracts from the XVIth Congress of the International Primatological Society and the XIXth Conference of the American Society of Primatologists. Wisconsin Regional Primate Research Center, Madison, not paginated. (abstract only)

———. 1998. Menopause in free-ranging rhesus macaques: Estimated incidence, relation to body condition, and adaptive significance. International Journal of Primatology, **19:** 751–765.

Johnson, R.L., I. Malik, and C. M. Berman. 1991. Age- and dominance-related variation in feeding time

among free-ranging female rhesus monkeys. International Journal of Primatology, **12:** 337–356.

Johnson, R. L., and C. H. Southwick. 1984. Structural diversity and mother-infant relations among rhesus monkeys in India and Nepal. Folia Primatologica, **43:** 198–215.

Johnson, R. L., J. Teas, N. Bishop, and C. H. Southwick. 1988. A decade of stability in a Nepalese macaque population. Journal of Mammalogy, **69:** 178–180.

Joslin, J., H. Fletcher, and J. Emlen. 1964. A comparison of the responses to snakes of lab- and wild-reared rhesus monkeys. Animal Behaviour, **12:** 348–352.

Judge, P. G., and F. B. M. de Waal. 1994. Intergroup grooming relations between alpha females in a population of free-ranging rhesus macaques. Folia Primatologica, **63:** 63–70.

Kanthaswamy, S., and D. G. Smith. 1998. Use of microsatelite polymorphisms for paternity exclusion in rhesus macaques (*Macaca mulatta*). Primates, **39:** 135–145.

Kao Yüeh-ting, Lu Chang-kwun, Chang Chieh, and Wang Sung. 1962. Mammals of the Hsi-Shuan-Pan-Na area in southern Yunnan. Acta Zoologica Sinica, **14:** 180–196. (in Chinese, English summary)

Kaplan, J. R., M. B. Fontenot, J. Berard, S. B. Manuck, and J. J. Mann. 1995. Delayed dispersal and elevated monoaminergic activity in free-ranging rhesus monkeys. American Journal of Primatology, **35:** 229–234.

Karan, P. P. 1960. Nepal: A Cultural and Physical Geography. University of Kentucky Press, Lexington, 101 pp.

Karr, S. L., R. V. Henrickson, and J. G. Else. 1979. A survey for Anatrichosoma (Nematoda: Trichinellida) in wild-caught *Macaca mulatta*. Laboratory Animal Science, **29:** 789–790.

———. 1980. A survey for intestinal helminths in recently wild-caught *Macaca mulatta* and results of treatment with mebendazole and thiabendazole. Journal of Medical Primatology, **9:** 200–204.

Kaufmann, J. H. 1965. A three-year study of mating behavior in a freeranging band of rhesus monkeys. Ecology, **46:** 500–512.

Kaulback, R. 1938. Salween. Hodder and Stoughton, London, 313 pp.

Kellogg, R. 1945. Macaques, pp. 113–134. *In* Aberle, S. D., ed., Primate Malaria. National Research Council, Division of Medical Science, Office of Medical Information, Washington, D.C.

Kemnitz, J. W. 1994. Effects of gender and age on body size and composition of rhesus monkeys (*Macaca mulatta*). American Journal of Primatology, **33:** 220. (abstract only)

Kempf, E. J. 1917. The social and sexual behavior of infrahuman primates with some comparable facts in human behavior. Psychoanalytic Review, **4:** 127–154.

Kerr, G. R., J. R. Allen, G. Scheffler, and J. Couture. 1974. Fetal and postnatal growth of rhesus monkeys (*M. mulatta*). Journal of Medical Primatology, **3:** 221–235.

Kerr, R. 1792. The Animal Kingdom. . . A Strahan and T. Cadell and W. Creech, Edinburgh, xii + 400 pp.

Kessler, M. J., R. G. Rawlins, and P. L. Kaufman. 1986. The golden rhesus macaques of Cayo Santiago, pp. 263–268. *In* Rawlins, R. G., and M. J. Kessler, eds., The Cayo Santiago Macaques: History, Behavior and Biology. State University of New York Press, Albany.

Keverne, E. B. 1981. Do Old World primates have oestrus? Malaysian Applied Biology, **10:** 119–126.

Khajuria, H. [1955]. Catalogue of mammals in the Indian Museum (Zool. Surv.). II. Primates: Cercopithecidae. Records of the Indian Museum, **52:** 101–127. (For date of publication, see Khajuria, H., 1956, Records of the Indian Museum, **52:** 195.)

———. 1962a. Some field observations on the habits of the capped langur and the barking deer in the Garo Hills, Assam. Records of the Indian Museum, **58:** 121–122.

———. 1962b. Further observations on the Gee's langur, *Presbytis geei* Khajuria, with remarks on the classification of Indian Colobidae (Mammalia: Primates). Records of the Indian Museum, **58:** 123–130.

———. 1966. Some observations on the habits of the Assamese macaque, p. 284. *In* Thapar, G. S., ed., Proceedings of the Second All-India Congress of Zoology, 1962. Part 2. Scientific Papers. Zoological Society of India, Calcutta.

Khajuria, H., and R. K. Ghose. 1970. On a collection of small mammals from Darjeeling District, West Bengal. Journal of the Bengal Natural History Society, **36:** 15–36.

Khan, M. A. R. 1981. The non-human primates of Bangladesh. Tigerpaper, **8**(1): 12–15.

———. 1985. Mammals of Bangladesh. Nazma Reza, Dhaka, 92 pp.

———. 1986. Wildlife in Bangladesh mangrove ecosystem. Journal of the Bombay Natural History Society, **83:** 32–48.

King, A. H., and E. D. Schneiderman. 1991. Comparison of craniofacial dimensions in free-ranging and laboratory rhesus macaques (*Macaca mulatta*). American Journal of Physical Anthropology, **Supplement 12:** 105. (abstract only)

Kirk, J. H. 1972. Growth of maturing *Macaca mulatta*. Laboratory Animal Science, **22:** 573–575.

Kloss, C. B. 1917. Description of a new macaque from Siam. Journal of the Natural History Society of Siam. **2:** 247–249.

———. 1930. On mammals from the Raheng district, Western Siam. Introduction. Journal of the Siam Society, Natural History Supplement, **8:** 61–63.

Knezevich, M. 1997. Geophagy as a therapeutic mediator of endoparasitism in a free-ranging group of rhesus macaques (*Macaca mulatta*). American Journal of Primatology, **44:** 71–83. (For date of publication, see outside back cover.)

Koford, C. B. 1963. Group relations in an island colony of rhesus monkeys, pp. 136–152. *In* Southwick, C. H., ed., Primate Social Behavior. Van Nostrand, Princeton, NY.

———. 1965. Population dynamics of rhesus monkeys

on Cayo Santiago, pp. 160–174. *In* DeVore, I., ed., Primate Behavior. Holt, Rinehart and Winston, New York.

———. 1966. Population changes in rhesus monkeys: Cayo Santiago, 1960–1964. Tulane Studies in Zoology, **13:** 1–7.

Koppikar, B. R., and J. H. Sabnis. 1976. Identification of hairs of some Indian mammals. Journal of the Bombay Natural History Society, **73:** 5–20.

Koyama, N., and P. B. Shekar. 1981. Geographic distribution of the rhesus and the bonnet monkeys in west central India. Journal of the Bombay Natural History Society, **78:** 240–255.

Kriete, M. F., M. Champoux, and S. J. Suomi. 1995. Development of iron deficiency anemia in infant rhesus macaques. Laboratory Animal Science, **45:** 15–20.

Krishnan, M. 1972. An ecological survey of the larger mammals of peninsular India. Journal of the Bombay Natural History, **68:** 503–555. (For date of publication, see table of contents.)

Krumbiegel, I. 1965. Säugetierkundliche Beobachtungen im Vorderen Orient und in Indien. Säugetierkundliche Mitteilungen, **13:** 32–39.

Küchler, A. W. 1978. Natural vegetation, pp. 16–17. *In* Espenshade, E. B., Jr., and J. L. Morrison, eds., Goode's World Atlas, 15th edition. Rand McNally & Company, Chicago.

Kuehn, R. E., and W. C. Young. 1965. Mating behavior in adult *Macaca mulatta*. American Zoologist, **5:** 687–688. (abstract only)

Kullmann, E. 1970. Die Tierwelt Ostafghanistans in ihren geographischen Beziehungen. Freunde des Kölner Zoo. **13:** 3–25.

Kurup, G. U. 1965. On a collection of mammals from Assam and Uttar Pradesh. Journal of the Bengal Natural History Society, **33:** 185–209.

———. 1984. Nonhuman primate census surveys in southern India, pp. 57–65. *In* Roonwal, M. L., S. M. Mohnot, and N. S. Rathore, eds., Current Primate Researches. Department of Zoology, University of Jodhpur, Jodhpur.

———. 1992. Census survey and population ecology of rhesus macaque, *Macaca mulatta*, (Zimmermann) in South India. Primate Report, **34:** 13–23.

Lahan, P., and R. N. Sonowal. 1974. Kaziranga Wild Life Sanctuary, Assam: A brief description and report on the census of large animals (March 1972). Journal of the Bombay Natural History Society, **70:** 245–278.

Lal, O. P. 1990. A survey study of insect and non-insect pests, parasitoids and predators from Kullu Valley, Himachal Pradesh (India). Journal of Entomological Research, **14:** 99–125.

Lan Daoying, and Guo Guang. 1995. Present status on conservation of primates in Lincang District of Yunnan. Chinese Primate Research and Conservation News, **4:** 4–7. (Chinese and English texts)

Langley, J. N., and C. S. Sherrington. 1891. On pilomotor nerves. Journal of Physiology, **12:** 278–291.

Latreille, P. A. 1804. Tableau méthodique des singes, pp. 275–298. *In* Sonnini, C. S., ed., Histoire Naturelle Générale et Particuliere, par Leclerc de Buffon. Dufart, Paris.

Lau, M. W. 1995. Notes on the herpetofauna on Neilingding Island in the Pearl River Estuary, China. Memoirs of the Hong Kong Natural History Society, **20:** 209–213.

Lauer, C. 1980. Seasonal variability in spatial defence by free-ranging rhesus monkeys (*Macaca mulatta*). Animal Behaviour, **28:** 476–482.

Laws, J. W., and J. V. H. Laws. 1984. Social interactions among adult male langurs (Presbytis entellus) at Rajaji Wildlife Sanctuary. International Journal of Primatology, **5:** 31–50.

Legendre, S. J. 1932. Adventures on hunting trails in Indo-China. Natural History, **32:** 481–496.

———. 1936. Land of the White Parasol and the Million Elephants. Dodd, Mead & Company, New York, 315 pp.

Lehman, S. M., L. L. Taylor, and S. P. Easley. 1994. Climate and reproductive seasonality in two free-ranging island populations of rhesus macaques (*Macaca mulatta*). International Journal of Primatology, **15:** 115–128.

Li Youheng, and Han Defen. 1978. The mammalian fauna of the Neolithic cave site of Zhenpiyan, Guilin (Guangxi). Vertebrata PalAsiatica, **16:** 244–254. (in Chinese)

Li Yan-xian, and Lei Ci-yu. 1980. Fossil mammals from Lishui, Jiangsu. Vertebrata PalAsiatica, **18:** 59–64. (in Chinese, English abstract)

Lindburg, D. G. 1969. Rhesus monkeys: Mating season mobility of adult males. Science, **166:** 1176–1178.

———. 1971. The rhesus monkey in North India: An ecological and behavioral study, pp. 1–106. *In* Rosenblum, L. A., ed., Primate Behavior: Developments in Field and Laboratory Research, Volume 2. Academic Press, New York.

———. 1973. Grooming behavior as a regulator of social interactions in rhesus monkeys, pp. 124–148. *In* Carpenter, C. R., ed., Behavioral Regulators of Behavior in Primates. Bucknell University Press, Lewisburg, PA.

———. 1977a. Dietary habits of rhesus monkeys (*Macaca mulatta* Zimmermann) in Indian forests. Journal of the Bombay Natural History Society, **73:** 261–269. (For date of publication, see table of contents.)

———. 1977b. Feeding behaviour and diet of rhesus monkeys (*Macaca mulatta*) in a Siwalik Forest in North India, pp. 223–249. In Clutton-Brock, T. H., ed., Primate Ecology: Studies of Feeding and Ranging Behaviour in Lemurs, Monkeys, and Apes. Academic Press, London.

———. 1983. Mating behavior and estrus in the Indian rhesus monkey, pp. 45–61. *In* Seth, P. K., ed., Perspectives in Primate Biology. Today & Tomorrow's Printers, New Delhi.

———. 1987. Seasonality of reproduction in primates, pp. 167-218. *In* Mitchell, G., and J. Erwin, eds., Comparative Primate Biology, Vol. 2, Part B. Behavior, Cognition, and Motivation. Alan R. Liss, New York.

Lindsay, H. M. 1926. Bombay Natural History Society's Mammal Survey of India, Burma and Ceylon. Report

Nos. 43–45. Journal of the Bombay Natural History Society, **31:** 591–612.

Lippold, L. K. 1995. Distribution and Conservation of the douc langur (*Pygathrix nemaeus*) in Vietnam, pp. 197–202. *In* Xia Wuping and Zhang Yongzu, eds., Primate Research and Conservation. China Forestry Publishing House, Beijing.

Litton, K. J., and M. K. Izard. 1999. Reproductive statistics in a specific pathogen-free breeding colony of rhesus macaques (*Macaca mulatta*). American Journal of Primatology, **49:** 74. (abstract only)

Liu Wanfu, and Wei Zhenyi. 1995. Present status and protection of primate resources in Guangxi, China, pp. 123–132. *In* Xia Wuping and Zhang Yongzu, eds., Primate Research and Conservation. China Forestry Publishing House, Beijing. (in Chinese, English abstract)

Lowe, W. P. 1932. The Trail That Is Always New. Gurney and Jackson, London, 271 pp.

———. 1933. A report on the birds collected by the Vernay Expedition to Tenasserim and Siam. Ibis, 13th series, **3:** 259–283.

Loy, J. 1970. Peri-menstrual sexual behavior among rhesus monkeys. Folia Primatologica, **13:** 286–297.

———. 1971. Estrous behavior of free-ranging rhesus monkeys (*Macaca mulatta*). Primates, **12:** 1–31.

Loy, J., and K. Loy. 1982. Sexual behavior of castrated rhesus monkeys. International Journal of Primatology, **3:** 308. (abstract only)

Lumer, H., and A. H. Schultz. 1941. Relative growth of the limb segments and tail in macaques. Human Biology, **13:** 283–305.

Lydekker, R. 1880. A sketch of the history of the fossil Vertebrata of India. Journal of the Asiatic Society of Bengal, **49:** 8–40.

Lyon, M. W., Jr., and W. H. Osgood. 1909. Catalogue of the type-specimens of mammals in the United States National Museum, including the Biological Survey collection. Bulletin of the United States National Museum, **62:** i–x, 1–325.

Ma Ancheng, and Tang Huliang. 1992. On discovery and significance of a Holocene *Ailuropoda-Stegodon* fauna from Jinhua, Zhejiang. Vertebrata PalAsiatica, **30:** 295–312. (in Chinese, English summary)

Ma Guoyao. 1988. Investigation of the mammals at Baishuijiang Natural Reserve. Chinese Journal of Zoology, **23:** 26–28. (in Chinese)

Ma Shilai, and Wang Yingxiang. 1988. The recent distribution, status and conservation of primates in China. Acta Theriologica Sinica, **8:** 250–260. (in Chinese, English summary)

MacArthur, J. A., J. H. Seamer, and D. Veall. 1978. Establishment of a small colony of rhesus monkeys. Laboratory Animals, **12:** 151–156.

Mackay, E. 1931. Figurines and model animals, pp. 338–355. *In* J. Marshall, ed., Mohenjo-daro and the Indus Civilization. Arthur Probsthain, London.

MacKinnon, J. R., and K. S. MacKinnon. 1987. Conservation status of the primates of the Indo-Chinese Subregion. Primate Conservation, **8:** 187–195.

Mahaney, W. C., A. Stambolic, M. Knezevich, R. G. V. Hancock, S. Aufreiter, K. Sanmugadas, M. J. Kessler, and M. D. Grynpas. 1995. Geophagy amongst rhesus macaques on Cayo Santiago, Puerto Rico. Primates, **36:** 322–333.

Maity, B., and D. S. Rathore. 1998. Postnatal growth of captive rhesus macaques (*Macaca mulatta*) during the first month of life. Journal of the Bombay Natural History Society, **95:** 246–254.

Makwana, S. C. 1978. Field ecology and behaviour of the rhesus macaque (*Macaca mulatta*) : I. Group composition, home range, roosting sites, and foraging routes in the Asarori Forest. Primates, **19:** 483–492.

———. 1979a. Field ecology and behaviour of the rhesus macaque (*Macaca mulatta*) : II. Food, feeding and drinking in Dehra Dun forests. Indian Journal of Forestry, **2:** 242–253.

———. 1979b. Observations on ecology and behaviour of the rhesus monkey *Macaca mulatta* in Asarori. Journal of the Bombay Natural History Society, **75:** 919–921. (For date of publication, see table of contents.)

Makwana, S. C., and R. S. Pirta. 1978. Field ecology and behaviour of the rhesus macaque, *Macaca mulatta*: 4. Development and behaviour of an independent and stable all-juvenile group. Biology of Behaviour, **3:** 163–167.

———. 1983. On the composition of rhesus (*Macaca mulatta*) population of Asarori Forest, North India. Comparative Physiology and Ecology, **8:** 301–302.

Malhotra, Y. R., and D. N. Sahi. 1982. A population survey of non-human primates in some parts of Jammu Province (J & K State), India. Tigerpaper, **9**(1): 24–27.

———. 1984. A population survey of nonhuman primates in some parts of Jammu Province, India, pp. 75–80. In Roonwal, M. L., S. M. Mohnot, and N. S. Rathore, eds., Current Primate Researches. Department of Zoology, University of Jodhpur, Jodhpur.

Malik, I. 1986. Time budgets and activity patterns in free-ranging rhesus monkeys, pp. 105–114. *In* Else, J. G., and P. C. Lee, eds., Primate Ecology and Conservation. Cambridge University Press, New York.

———. 1989a. Population growth and stabilizing age structure of the Tughlaqabad rhesus. Primates, **30:** 117–120.

———. 1989b. Possibilities of self-sustenance of free ranging rhesus of Tughlaqabad. Journal of the Bombay Natural History Society, **85:** 578–584. (For date of publication, see table of contents.)

———. 1992. Consequences of export and trapping of monkeys. Primate Report, **34:** 5–11.

Malik, I., and R. L. Johnson. 1991. Trapping and conservation: Development of a translocation in India, pp. 63–64. *In* Ehara, A., T. Kimura, O. Takenaka, and M. Iwamoto, eds., Primatology Today. Elsevier Science Publishers, Amsterdam.

———. 1992. Reproductive maturation and senescence in female rhesus: Observations from Tughlaqabad, India. Primate Report, **34:** 25–32.

———. 1994. Commensal rhesus in India: The need and cost of translocation. Revue d'Écologie (Terre & Vie), **49:** 233–243.

Malik, I., and V. Mennon. 1992. A comparative study of the behaviour of free ranging and caged rhesus in India. Primate Report, **34:** 33–46.

MALIK, I., P. K. SETH, AND C. H. SOUTHWICK. 1984. Population growth of free-ranging rhesus monkeys at Tughlaqabad. American Journal of Primatology, **7:** 311–321.

———. 1985. Group fission in free-ranging rhesus monkeys of Tughlaqabad, northern India. International Journal of Primatology, **6:** 411–422.

MALIK, I., AND C. H. SOUTHWICK. 1988a. Feeding behaviour of free-ranging rhesus of Tughlaqabad. Journal of the Bombay Natural History Society, **84:** 336–349. (For date of publication, see table of contents.)

———. 1988b. Feeding behavior and activity patterns of rhesus monkeys (*Macaca mulatta*) at Tughlaqabad, India, pp. 95–111. *In* Fa, J. E., and C. H. Southwick, eds., Ecology of Food-Enhanced Primate Groups. Alan R. Liss, New York.

MANDAL, A. K. 1964. The behaviour of the rhesus monkeys (*Macaca mulatta* Zimmermann) in the Sundarbans. Journal of the Bengal Natural History Society, **33:** 153–165.

MANN, D. R., M. A. AKINBAMI, K. G. GOULD, K. PAUL, AND K. WALLEN. 1998. Sexual maturation in male rhesus monkeys: Importance of neonatal testosterone exposure and social rank. Journal of Endocrinology, **156:** 493–501.

MANOHAR, B. R., AND R. MATHUR. 1992. Interspecific play behaviour between Hanuman langur *Presbytis entellus* and rhesus macaque *Macaca mulatta*. Journal of the Bombay Natural History Society, **89:** 114–115.

MANRY, D. 1991. Rhesus redux on Hainan Island: China's first primate reserve. Pacific Discovery, **44:** 8–17.

MANSON, J. H. 1992. Measuring female mate choice in Cayo Santiago rhesus macaques. Animal Behaviour, **44:** 405–416.

———. 1994. Influences on mount series duration in free-ranging rhesus macaques (*Macaca mulatta*). American Journal of Physical Anthropology, Supplement **18:** 136. (abstract only)

———. 1996a. Male dominance and mount series duration in Cayo Santiago rhesus macaques. Animal Behaviour, **51:** 1219–1231.

———. 1996b. Primate consortships: A critical review and some new data from free-ranging rhesus macaques. American Journal of Physical Anthropology, Supplement **22:** 156. (abstract only)

———. 1997. Primate consortships: A critical review. Current Anthropology, **38:** 353–363, 369–374.

MANSON, J. H., AND S. E. PERRY. 1993. Inbreeding avoidance in rhesus macaques: Whose choice? American Journal of Physical Anthropology, **90:** 335–344.

MARATHE, A. R., AND A. MAHABAL. 1984. Rhesus macaque in Ajanta paintings. Bulletin of the Deccan College Research Institute, **43:** 73–77.

MARRIOTT, B. M. 1978a. Feeding patterns of wild rhesus monkeys (*M. mulatta*) in Nepal. Federation Proceedings, **37:** 759. (abstract only)

———. 1978b. Preliminary report on feeding patterns of rhesus monkeys (*M. mulatta*) in Kathmandu, Nepal, p. [27]. Abstracts for the Second Annual Meeting of the American Society of Primatologists. Emory University, Atlanta, not paginated. (abstract only)

———. 1988. Time budgets of rhesus monkeys (*Macaca mulatta*) in a forest habitat in Nepal and on Cayo Santiago, pp. 125–149. *In* Fa, J. E., and C. H. Southwick, eds., Ecology of Food-Enhanced Primate Groups. Alan R. Liss, New York.

MARRIOTT, B. M., E. PEARSON, J. ROEMER, AND R. O. WOODBURY. 1993. Selection of dietary supplements by free-ranging rhesus monkeys on Cayo Santiago. American Journal of Primatology, **30:** 332. (abstract only)

MARSDEN, H. M. 1968. Behaviour between two social groups of rhesus monkeys within tunnel-connected enclosures. Folia Primatologica, **8:** 240–246.

———. 1973. Aggression within social groups of rhesus monkeys (*Macaca mulatta*) : Effect of contact between groups. Animal Behaviour, **21:** 247–249.

MARSHALL, P. 1967. Wild Mammals of Hong Kong. Oxford University Press, Hong Kong, 64 pp.

MASTROIANNI, L., JR., AND W. A. MANSON. 1963. Collection of monkey semen by electroejaculation. Proceedings of the Society for Experimental Biology and Medicine, **112:** 1025–1027.

MATHUR, R. 1982. Some observations on monkeys around Jaipur, India (*Macaca mulatta* and *Presbytis entellus*), pp. 11–12. *In* Roonwal, M. L., S. M. Mohnot, and N. S. Rathore, eds., International Symposium on Primates, Jodhpur: 17–20 February, 1982, Abstracts of Papers. Department of Zoology, University of Jodhpur, Jodhpur. (abstract only)

———. 1994. Parturition in feral rhesus macaque (*Macaca mulatta*): A case report. Journal of the Bombay Natural History Society, **91:** 132–133.

MATHUR, R., AND A. LOBO. 1990. Intrusion of a rhesus *Macaca mulatta* pair into a langur *Presbytis entellus* group. Journal of the Bombay Natural History Society, **86:** 308–312.

MATHUR, R., AND B. R. MANOHAR. 1990. Density of *Macaca mulatta* and *Presbytis entellus* in the old city of Jaipur: A three year study. Applied Animal Behaviour Science, **27:** 351–361.

MATSCHIE, P. 1912. Zur Kenntnis der Südchinesischen Kurzschwanz-Makaken. Sitzungbericht der Gesellschaft Naturforschender Freunde zu Berlin, **1912:** 305–310.

MAYR, E. 1963. Animal Species and Evolution. Belknap Press of Harvard University Press, Cambridge, Massachusetts, 797 pp.

MAYR, E., E. G. LINSLEY, AND R. L. USINGER. 1953. Methods and Principles of Systematic Zoology. McGraw-Hill, New York, 328 pp.

MCCANN, C. 1933a. Notes on the colouration and habits of the white-browed gibbon or hoolock (*Hylobates hoolock* Harl.). Journal of the Bombay Natural History Society, **36:** 395–405.

———. 1933b. Notes on some Indian macaques. Journal of the Bombay Natural History Society, **36:** 796–810.

MCMAHON, A. H. 1901a. Notes on the fauna of Chitral. Journal of the Asiatic Society of Bengal, **70**(Part II): 1–7.

———. 1901b. Notes on the fauna of Dir and Swat. Journal of the Asiatic Society of Bengal, **70**(Part II): 7–12.

McMillan, C. A. 1982a. Dominance, adult-subadult status and male mating success in rhesus monkeys. American Journal of Physical Anthropology, **57:** 207. (abstract only)

———. 1982b. Male age and mating success among rhesus macaques. International Journal of Primatology, **3:** 312. (abstract only)

McNamara, J. A., Jr., D. L. Foster, and B. D. Rosenstein. 1977. Eruption of the deciduous dentition in the rhesus monkey. Journal of Dental Research, **56:** 701.

McNeely, J. A. 1992. Protected areas in a changing world: The management approaches that will be required to enable primates to survive into the 21st century, pp. 373–383. *In* Itoigawa, N., Y. Sugiyama, G. P. Sackett, and R. K. R. Thompson, eds., Topics in Primatology, Volume 2, Behavior, Ecology, and Conservation. University of Tokyo Press, Tokyo.

Mehlman, P. T., J. D. Higley, I. Faucher, A. A. Lilly, D. M. Taub, J. Vickers, S. J. Suomi, and M. Linnoila. 1995. Correlation of CSF 5-HIAA concentration with sociality and the timing of emigration in free-ranging primates. American Journal of Psychiatry, **152:** 907–913.

Meikle, D. B., B. L. Tilford, and S. H. Vessey. 1984. Dominance rank, secondary sex ratio, and reproduction of offspring in polygynous primates. American Naturalist, **124:** 173–188.

Mell, R. 1922. Beiträge zur Fauna sinica. I. Die Vertebraten Südchinas; Feldlisten und Feldnoten der Säuger, Vögel, Reptilien, Batrachier. Archiv für Naturgeschichte, **88:** 1–146.

Melnick, D. J. 1988. The genetic structure of a primate species: Rhesus macaques and other cercopithecine monkeys. International Journal of Primatology, **9:** 195–231.

Melnick, D. J., and G. A. Hoelzer. 1993. What is mtDNA good for in the study of primate evolution? Evolutionary Anthropology, **2:** 2–10.

———. 1996. The population genetic consequences of macaque social organization and behaviour, pp. 413–443. *In* Fa, J. E., and D. G. Lindburg, eds., Evolution and Ecology of Macaque Societies. Cambridge University Press, New York.

Melnick, D. J., G. A. Hoelzer, R. Absher, and M. V. Ashley. 1993. MtDNA diversity in rhesus monkeys reveals overestimates of divergence time and paraphyly with neighboring species. Molecular Biology and Evolution, **19:** 282–295.

Melnick, D. J., G. A. Hoelzer, and R. L. Honeycutt. 1992. Mitochondrial DNA: Its uses in anthropological research, pp. 179–233. *In* Devor, E. J., ed., Molecular Applications in Biological Anthropology. Cambridge University Press, Cambridge.

Melnick, D. J., C. J. Jolly, and K. K. Kidd. 1984. The genetics of a wild population of rhesus monkeys (*Macaca mulatta*). I. Genetic variability within and between social groups. American Journal of Physical Anthropology, **63:** 341–360.

———. 1986. The genetics of a wild population of rhesus monkeys (*Macaca mulatta*). II. The Dunga Gali population in species-wide perspective. American Journal of Physical Anthropology, **71:** 129–140.

Melnick, D. J., and K. K. Kidd. 1983. The genetic consequences of social group fission in a wild population of rhesus monkeys (*Macaca mulatta*). Behavioral Ecology and Sociobiology, **12:** 229–236.

Melnick, D. J., and M. C. Pearl. 1987. Cercopithecines in multimale groups: Genetic diversity and population structure, pp. 121–134. *In* Smuts, B. B., D. L. Cheney, R. M. Seyfarth, R. W. Wrangham, and T. T. Struhsaker, eds., Primate Societies. University of Chicago Press, Chicago.

Melnick, D. J., M. C. Pearl, and A. F. Richard. 1984. Male migration and inbreeding avoidance in wild rhesus monkeys. American Journal of Primatology, **7:** 229–243.

Michael, R. P. 1965. Some aspects of the endocrine control of sexual activity in primates. Proceedings of the Royal Society of Medicine, **58:** 595–598.

Michael, R. P., and G. Saayman. 1967a. Sexual performance and the timing of ejaculation in male rhesus monkeys (*Macaca mulatta*). Journal of Comparative and Physiological Psychology, **64:** 213–218.

———. 1967b. Individual differences in the sexual behaviour of male rhesus monkeys (*Macaca mulatta*) under laboratory conditions. Animal Behaviour, **15:** 460–466.

Michael, R. P., M. I. Wilson, and T. M. Plant. 1973. Sexual behaviour of male primates and the role of testosterone, pp. 236–313. *In* Michael, R. P., and J. H. Crook, eds., Comparative Ecology and Behaviour of Primates. Academic Press, London.

Michael, R. P., M. I. Wilson, and D. Zumpe. 1974. The bisexual behavior of female rhesus monkeys, pp. 399–412. *In* Friedman, R. C., R. M. Richart, and R. L. Vande Wiele, eds., Sex Differences in Behavior. John Wiley & Sons, New York.

Michael, R. P., and D. Zumpe. 1970. Sexual initiating behaviour by female rhesus monkeys (*Macaca mulatta*) under laboratory conditions. Behaviour, **36:** 168–186.

———. 1976. Environmental and endocrine factors influencing annual changes in sexual potency in primates. Psychoneuroendocrinology, **1:** 303–313.

———. 1993. A review of hormonal factors influencing the sexual and aggressive behavior of macaques. American Journal of Primatology, **30:** 213–241.

Mills, J. P. 1923. Bombay Natural History Society's Mammal Survey of India, Burma and Ceylon. Report No. 36, Naga Hills. Journal of the Bombay Natural History Society, **29:** 221–229.

Milne-Edwards, A. [1870]. Planche 32: *Macacus Tcheliensis*. . . and Planche 33: Tête osseuse du *Macacus Tcheliensis*. . . *In* Milne-Edwards, H., and A. Milne-Edwards, Recherches pour Servir a l'Histoire Naturelle des Mammifères, Vol. 2—Atlas. (For date of publication, see Volume 1, p. 229.)

———. [1872]. Études pour servir a l'histoire de la faune mammalogique de la Chine, pp. 67–229. *In* Milne-Edwards, H., and A. Milne-Edwards, Recherches pour Servir a l'Histoire Naturelle des Mammifères, Volume 1—Texte. (For date of publication, see Zoological Record: Mammalia, 1872, **9:** 2, 7.)

———. 1892. Observations sur les mammifères du Thibet. Revue Générale des Sciences Pures et Appliquées, **3:** 670–672.

Mineka, S., M. Davidson, M. Cook, and R. Keir. 1984. Observational conditioning of snake fear in rhesus monkeys. Journal of Abnormal Psychology, **93:** 355–372.

Mineka, S., R. Keir, and V. Price. 1980. Fear of snakes in wild-and laboratory-reared rhesus monkeys (*Macaca mulatta*). Animal Learning and Behavior, **8:** 653–663.

Missakian, E. A. 1973a. Genealogical mating activity in free-ranging groups of rhesus monkeys (*Macaca mulatta*) on Cayo Santiago. Behavior, **45:** 225–241.

———. 1973b. The timing of fission among free-ranging rhesus monkeys. American Journal of Physical Anthropology, **38:** 621–624.

Missakian, E. A., L. R. del Rio, and R. E. Myers. 1969. Reproductive behavior of captive male rhesus monkeys (*Macaca mulatta*). Communications in Behavioral Biology, Part A, **4:** 231–235.

Mollendorf, O. F. von. 1889. Contributions to the natural history of North China. Mittheilungen der Deutschen Gesellschaft für Natur- und Völkerkunde Ostasiens in Tokio, 1 (9, Zweite Auflage): 7–19.

Moore, J. C., and G. H. H. Tate. 1965. A study of the diurnal squirrels, Sciurinae, of the Indian and Indochinese Subregions. Fieldiana: Zoology, **48:** 1–351.

Morales, J. C., and D. J. Melnick. 1998. Phylogenetic relationships of the macaques (Cercopithecidae: *Macaca*), as revealed by high resolution restriction site mapping of mitochondrial ribosomal genes. Journal of Human Evolution, **34:** 1–23.

Morin, P. A., S. Kanthaswamy, and D. G. Smith. 1997. Simple sequence repeat (SSR) polymorphisms for colony management and population genetics in rhesus macaques (*Macaca mulatta*). American Journal of Primatology, **42:** 199–213.

Morris, R. C. 1936. The Vernay-Hopwood Upper Chindwin Expedition. Journal of the Bombay Natural History Society, **38:** 647–671.

Morris, R., and D. Morris. 1966. Men and Apes. McGraw-Hill, New York.

Morrison, J. A., and E. W. Menzel, Jr. 1972. Adaptation of a free-ranging rhesus monkey group to division and transplantation. Wildlife Monographs, **31:** 4–78.

Mouri, T. 1995. Sex differences of the cranial size in macaque species. Reichorui Kenkyu/Primate Research, **11:** 187–196. (in Japanese, English summary)

———. 1996. Multivariate cranial ontogenetic allometries in crab-eating, rhesus and Japanese macaques. Anthropological Science, **104:** 281–303.

Muir, G. B. F. 1916. Monkeys (*Macacus rhesus*) swimming. Journal of the Bombay Natural History Society, **24:** 353.

Mukherjee, A. K., and S. Gupta. 1965. Habits of the rhesus macaque *Macaca mulatta* (Zimmermann) in the Sunderbans, 24-Parganas, West Bengal. Journal of the Bombay Natural History Society, **62:** 145–146.

Mukherjee, R. P. 1969. A field study on the behaviour of two roadside groups of rhesus macaque [*Macaca mulatta* (Zimmermann)] in northern Uttar Pradesh. Journal of the Bombay Natural History Society, **66:** 47–56.

———. 1977. Rhesus and other monkeys of Tripura. Newsletter of the Zoological Survey of India, **3:** 111.

———. 1978a. Effects of crowding on temple rhesus monkeys of Imphal, Manipur. Journal of the Bombay Natural History Society, **74:** 275–281. (For date of publication, see table of contents.)

———. 1978b. Further observations on the golden langur (*Presbytis geei* Khajuria, 1956), with a note to capped langur (*Presbytis pileatus* Blyth, 1843) of Assam. Primates, **19:** 737–747.

———. 1982. Survey of non-human primates of Tripura, India. Journal of the Zoological Society of India, **34:** 70–81.

———. 1984. Behaviour of rhesus macaque (*Macaca mulatta*) at Puri (Orissa) during the total solar eclipse of 1980, pp. 259–262. *In* Roonwal, M. L., S. M. Mohnot, and N. S. Rathore, eds., Current Primate Researches. Department of Zoology, University of Jodhpur, Jodhpur.

Mukherjee, R. P., S. Chaudhuri, and A. Murmu. 1995. Population survey of South-Asian non-human primates in and around Darjeeling. Primate Report, **41:** 23–32.

Mukherjee, R. P., and G. D. Mukherjee. 1972. Group composition and population density of rhesus monkey (*Macaca mulatta* (Zimmermann)) in northern India. Primates, **13:** 65–70.

Mukherjee, R. P., and S. S. Saha. 1974. The golden langurs (Presbytis geei Khajuria, 1956) of Assam. Primates, **15:** 327–340.

Napier, J. R., and P. H. Napier. 1967. A Handbook of Living Primates: Morphology, Ecology and Behaviour of Nonhuman Primates. Academic Press, London, 456 pp.

Napier, P. H. 1981. Catalogue of Primates in the British Museum (Natural History) and Elsewhere in the British Isles. Part II: Family Cercopithecidae, Subfamily Cercopithecinae. British Museum (Natural History), London, 203 pp.

National Atlas of India. 1979. National Atlas & Thematic Mapping Organisation, Department of Science & Technology, Government of India, Calcutta, 236 plates.

Naumann, C., and G. Nogge. 1973. Die Grossäuger Afghanistans. Zeitschrift des Kölner Zoo, **16:** 79–93.

Nawaz, M. 1983. Natural reserves in Pakistan. Tigerpaper, **10**(2): 1–6.

Neville, M. K. 1968a. A free-ranging rhesus monkey troop lacking adult males. Journal of Mammalogy, **49:** 771–773.

———. 1968b. Ecology and activity of Himalayan foothill rhesus monkeys (*Macaca mulatta*). Ecology, **49:** 110–123.

———. 1968c. Male leadership change in a free-ranging troop of Indian rhesus monkeys (*Macaca mulatta*). Primates, **9:** 13–27.

Nevison, C. M. 1997. Social rank and birth sex ratios in rhesus monkeys (*Macaca mulatta*). Applied Animal Behaviour Science, **51:** 285–291.

Nevison, C. M., F. D. G. Rayment, and M. J. A. Simpson. 1996. Birth sex ratios and maternal social rank

in a captive colony of rhesus monkeys (*Macaca mulatta*). American Journal of Primatology, **39:** 123–138.

Nguyen Lan Cuong. 1985. Fossile Menschenfunde aus Nordvietnam, pp. 96–102. *In* Herrmann, J., and H. Ullrich, eds., Menschwerdung—Biotischer und Gesellschaftlicher Entwicklungsprozess. Academie Verlag, Berlin.

Nisbett, R. A., and R. L. Ciochon. 1993. Primates in northern Viet Nam: A review of the ecology and conservation status of extant species, with notes on Pleistocene localities. International Journal of Primatology, **14:** 765–795.

Nolte, A. 1956. Field observations on the daily routine and social behaviour of common Indian monkeys, with special reference to the bonnet monkey (*Macaca radiata* Geoffroy). Journal of the Bombay Natural History Society, **53:** 177–184.

Oboussier, H., and G. A. von Maydell. 1959. Zur Kenntnis des Indischen Goldlangurs. Ergebnisse der Deutschen Indien-Expedition 1955–57. Leitung: G. A. Frhr. v. Maydell. Zeitschrift für Morpholgie und Ökologie der Tiere, **48:** 102–114.

———. 1960. Zur Kenntnis von *Presbytis entellus* (Dufresnes 1797). Ergebnisse der Deutschen Indien-Expedition 1955–57. Leitung: G. A. Frhr. v. Maydell. Zoologischer Anzeiger, **164:** 141–154.

Odoric of Pordenone, Friar. 1928. The journal of Friar Odoric, pp. 213–250. *In* Komroff, M., ed., Contemporaries of Marco Polo. Liveright, New York. Translation, original dictated in 1330.

Ogilby, W. [1840]. Memoir on the mammalogy of the Himalayas, pp. lvi–lxxiv. *In* Royle, J. F., Illustrations of the Botany and other Branches of the Natural History of the Himalayan Mountains, and of the Flora of Cashmere, Volume I. Wm. H. Allen and Co., London. (For date of publication, see Sherborn, C. D., 1922, Index Animalium 1801–1850, Part 1, p. cix, British Museum, London.)

Ojha, P. R. 1974. Tail carriage and dominance in the rhesus monkey, *Macaca mulatta*. Mammalia, **38:** 163–170.

———. 1977. A survey of bites and other injuries inflicted by rhesus macaques *Macaca mulatta* on man in Maroth village (Rajasthan, India). Journal of the Bombay Natural History Society, **73:** 518–521.

———. 1980. The rhesus macaque: Food freeding [sic] in desert. Antropologia Contemporanea, **3:** 249. (abstract only)

———. 1983. Infant-snatching behaviour in the rhesus macaque, *Macaca mulatta*, pp. 75–79. *In* Seth, P. K., ed., Perspectives in Primate Biology. Today & Tomorrow's Printers, New Delhi.

Olsen, J. W., and R. L. Ciochon. 1990. A review of evidence for postulated Middle Pleistocene occupations of Vietnam. Journal of Human Evolution, **19:** 761–788.

O'Neill-Wagner, P. L. 1997. Hair today, gone tomorrow: dye-marking and shaving help track hair loss and growth in rhesus monkeys. American Journal of Primatology, **42:** 138. (abstract only)

Oppenheimer, J. R., A. K. Akonda, and K. Z. Husain. 1983. Rhesus monkeys: Effect of habitat structure, human contact, and religious beliefs on population size, pp. 193–199. *In* Seth, P. K., ed., Perspectives in Primate Biology. Today & Tomorrow's Printers, New Delhi.

Osgood, W. H. 1932. Mammals of the Kelley-Roosevelts and Delacour Asiatic Expeditions. Field Museum of Natural History Publication 312, Zoological Series, **18:** 193–339.

Ouyang Zizhuo, and Ma Zhaolin. 1992. Rearing and reproduction in Chinese rhesus monkeys, pp. 11–17. *In* Chen Qiansheng, Ouyang Zizhuo, Ma Zhaolin, Zeng Huizhong, Ji Weizhi, Tian Baoping, Song Huaiyan, Yan Mingjie, Peng Chuangui, Zeng Zhongxing, Li Jingjing, and Li Xiaohang, eds., The Research and Exploitation of Primate Laboratory Animals in China. Chinese Science and Technology Publishers, Beijing. (Chinese and English texts.)

Pan Ruliang, N. G. Jablonski, C. Oxnard, and L. Freedman. 1998. Morphometric analysis of *Macaca arctoides* and *M. thibetana* in relation to other macaque species. Primates, **39:** 519–537.

Pan Ruliang, Peng Yanzhang, Ye Zhizhang, Wang Hong, and Yu Fahong. 1992. Classification and relationships of the macaque population on Hainan Island, China. Folia Primatologica, **59:** 39–43.

Pan Yuerong, and N. G. Jablonski. 1987. The age and geographical distribution of fossil cercopithecids in China. Human Evolution, **2:** 59–69.

Patel, T. 1996. Change of scene for monkey "gods." New Scientist, **152:** 10.

Paul, A. 1997. Breeding seasonality affects the association between dominance and reproductive success in non-human male primates. Folia Primatologica, **68:** 344–349.

Pearl, M. C., and S. J. Goldstein. 1984. Resource availability and mating patterns in a population of Himalayan rhesus monkeys. American Journal of Physical Anthropology, **63:** 203. (abstract only)

Pearl, M. C., D. J. Melnick, S. J. Goldstein, and A. F. Richard. 1987. All-weather monkeys. Animal Kingdom, **90:** 32–41.

Peng Yanzhang. 1990. Distribution and taxonomy of nonhuman primates in China. Primate Report, **26:** 17–28.

Peng Yanzhang, Pan Ruliang, Yu Fahong, Ye Zhizhang, and Wang Hong. 1993. Cranial comparison between populations of rhesus monkeys (*Macaca mulatta*) distributing China and India. Acta Theriologica Sinica, **13:** 1–10, 24. (in Chinese, English summary)

Pennant, T. 1771. Synopsis of Quadrupeds. J. Monk, Chester, England, xxv + 382 pp.

Percy, Professor. 1844. On the management of various species of monkeys in confinement. Proceedings of the Zoological Society of London, **1844:** 81–84.

Peugeot, C., C. Adelbrecht, and J. R. Anderson. 1994. Conflict activities during different conditions of feeding competition in rhesus monkeys, pp. 87–91. *In* Roeder, J. J., B. Thierry, J. R. Anderson, and N. Herrenschmidt, eds., Current Primatology: Volume II. Social Development, Learning and Behaviour. Université Louis Pasteur, Strasbourg.

Phoenix, C. H., and K. C. Chambers. 1988. Old age and sexual exhaustion in male rhesus macaques. Physiology and Behavior, **44:** 157–163.

Pickering, D. E., and N. E. Kontaxis. 1961. Thyroid function in the foetus of the macaque monkey (*Macaca mulatta*). II. Chemical and morphological characteristics of the foetal thyroid gland. Journal of Endocrinology, **23:** 267–275.

Pickering, D. E., and G. van Wagenen. 1969. The "golden" mulatta macaque (*Macaca mulatta*): Developmental and reproduction characteristics in a controlled laboratory environment. Folia Primatologica, **11:** 161–165.

Pilleri, G. 1975. Zoologisch-cetologische Expedition zum Indus und Brahmaputra im Winter 1973–1974. Investigations on Cetacea, **4**(Supplementum): 3–55.

Pilleri, G. and O. Pilleri. 1982. Some observations on mammals, birds and reptiles in the lower valley of the Indus and upper valley of the Brahmaputra. Bollettino della Società Adriatica di Scienze, **65:** 133–166. (For date of publication, see outside front cover.)

Pirta, R. S. 1977–78. Observations on group size, group composition and home range of rhesus monkeys in Asarori Forest, Nor[t]h India. Journal of Scientific Research, Banaras Hindu University, **28:** 123–134.

———. 1982. Conservation note: Socioecology and conservation of macaques and langurs in Varanasi, India. American Journal of Primatology, **2:** 401–403.

———. 1984. Cooperative behaviour in rhesus monkeys (*Macaca mulatta*) living in urban and forest areas. I. Genesis, pp. 271–283. *In* Roonwal, M. L., S. M. Mohnot, and N. S. Rathore, eds., Current Primate Researches. Department of Zoology, University of Jodhpur, Jodhpur.

Pirta, R. S., M. Gadgil, and A. V. Kharshikar. 1997. Management of the rhesus monkey *Macaca mulatta* and Hanuman langur *Presbytis entellus* in Himachal Pradesh, India. Biological Conservation, **79:** 97–106.

Pirta, R. S., and M. Singh. 1978. Establishment of home range, intraspecific and interspecific relations in rhesus monkeys (*Macaca mulatta*) under infant-infant rearing conditions. Proceedings of the Indian Academy of Sciences (B), **87:** 267–278.

———. 1980. Changes in home ranges of rhesus monkey (*Macaca mulatta*) groups living in natural habitats. Proceedings of the Indian Academy of Sciences (Animal Sciences), **89:** 515–525.

———. 1981. Forcible snatching and probable killing of infants by a rhesus (*Macaca mulatta*) alpha male in a wild habitat. Behaviour Analysis Letters, **1:** 339–344.

———. 1982. Differences in home ranges of rhesus monkey (*Macaca mulatta*) groups living in three ecological habitats. Proceedings of the Indian Academy of Sciences (Animal Sciences), **91:** 13–26.

Pocock, R. I. 1906. Notes upon menstruation, gestation, and parturition of some monkeys that have lived in the Society's Gardens. Proceedings of the Zoological Society of London, **1906:** 558–570.

———. 1931. The long-tailed macaque monkeys (*Macaca radiata* and *M. sinica*) of southern India and Ceylon. Journal of the Bombay Natural History Society, **35:** 276–288.

———. 1932. The rhesus macaques (*Macaca mulatta*). Journal of the Bombay Natural History Society, **35:** 530–551.

———. 1939. The Fauna of British India, including Ceylon and Burma. Mammalia.—Vol. I. Primates and Carnivora (in part), Families Felidae and Viverridae. Taylor and Francis, London, xxxiii + 463 pp.

———. 1941. The Fauna of British India, including Ceylon and Burma. Mammalia.—Vol. II. Carnivora (Continued from Volume I), Suborders Aeluroidea (Part) and Arctoidea. Taylor and Francis, London, vii + 503 pp.

Poirier, F. E. 1983. Chinese primates: Some real and one mythical (?). Explorers Journal, **61:** 124–131.

———. 1985. *Macaca mulatta* in China. National Geographic Research, **1:** 298–299.

Poirer, F. E., and Hu Hongxhin. 1983. *Macaca mulatta* and *Rhinopithecus* in China: Preliminary research results. Current Anthropology, **24:** 387–388.

Poole, A. J., and V. S. Schantz. 1942. Catalog of the type specimens of mammals in the United States National Museum, including the Biological Surveys collection. Bulletin of the United States National Museum, No. **178:** i-xiii, 1–705.

Pope, C. H. 1929. Notes on reptiles from Fukien and other Chinese provinces. Bulletin of the American Museum of Natural History, **58:** 335–487.

———. 1932a. Collecting in northern and central China, pp. 470–480. *In* Andrews, R. C., ed., The New Conquest of Central Asia. American Museum of Natural History, New York.

———. 1932b. Island of Hainan, 1922-1923, pp. 481–487. *In* Andrews, R. C., ed., The New Conquest of Central Asia. American Museum of Natural History, New York.

———. 1932c. Fukien and Kiangsi Provinces, 1925–1926, pp. 488–500. *In* Andrews, R. C., ed., The New Conquest of Central Asia. American Museum of Natural History, New York.

———. 1935. The Reptiles of China: Turtles, Crocodilians, Snakes, Lizards. American Museum of Natural History, New York, 604 pp.

———. 1940. China's Animal Frontier. Viking Press, New York, 192 pp.

Prakash, I. 1956. A list of the mammals of the Rajasthan desert. Journal of the Bengal Natural History Society, **28:** 1–7.

———. 1958. The breeding season of the rhesus monkey *Macaca mulatta* (Zimmermann) in Rajasthan. Journal of the Bombay Natural History Society, **55:** 154.

———. 1959. Checklist of mammals of Rajasthan desert. University of Rajputana. Studies. Biological Sciences, **4:** 30–56.

———. 1962. Group organization, sexual behaviour and breeding season of certain Indian monkeys. Japanese Journal of Ecology, **12:** 83–86.

Prater, S. H. 1980. The Book of Indian Animals, 3rd ed. (reprinted with corrections). Bombay Natural History Society, Bombay, xxiii + 324 pp.

Prétet, J.-L., J.-G. Guillet, and C. Butor. 1998. New widespread CXCR4 allele in rhesus macaques does not predict subspecies or clinical evolution. AIDS Research and Human Retroviruses, **14:** 639–641.

Primate Information Center. 1998. Primate index. Current Primate References, **98**(12): 27–28.

Pucak, G. J., H. L. Foster, and M. W. Balk. 1982. Key Lois and Raccoon Key: Florida islands for free-ranging rhesus monkey breeding programs. Journal of Medical Primatology, **11:** 199–210.

Puget, A. 1971. Observations sur le macaque rhesus, *Macaca mulatta* (Zimmermann, 1780), en Afganistan. Mammalia, **35:** 199–203.

Qu Wenyuan, Zhang Yongzu, D. Manry, and C. H. Southwick. 1993. Rhesus monkeys (*Macaca mulatta*) in the Taihang Mountains, Jiyuan County, Henan, China. International Journal of Primatology, **14:** 607–621.

Quan Guogiang, Wang Sung, and Zhang Yongzu. 1981. Classification and distribution of primates in China. Chinese Wildlife, **3:** 7–14. (in Chinese)

Rab, A., S. S. Sahibzada, and M. Afzal. 1991. Consort behaviour of free ranging rhesus monkeys (*Macaca mulatta*) of Pakistan. Pakistan Journal of Zoology, **23:** 219–224.

Rabinowitz, A., G. B. Schaller, and U Uga. 1995. A survey to assess the status of Sumatran rhinoceros and other large mammal species in Tamanthi Wildlife Sanctuary, Myanmar. Oryx, **29:** 123–128.

Raman, T. R. S., C. Mishra, and A. J. T. Johnsingh. 1996. Survey of primates in Mizoram, North-East India. Primate Conservation, **16:** 59–62. (For date of publication, see p. 67.)

Ranjitsinh. 1990. On the primates of Gumti Sanctuary, Tripura. Journal of the Bombay Natural History Society, **86:** 435.

Rashid, S. M. A., A. Khan, and M. A. R. Khan. 1990. Mammals of Cox's Bazar Forest Division (South), Bangladesh, with notes on their status and distribution. Journal of the Bombay Natural History Society, **87:** 62–67.

Ratajszczak, R., Ngoc Can, and Pham Nhat. 1992. A Survey for Tonkin Snub-Nosed Monkey (*Rhinopithecus avunculus*) in the North Vietnam, March, 1992. Unpublished report to WWF, Gland, Switzerland, and Fauna and Flora Preservation Society, London, 41 pp.

Raverty, H. G. 1859. Notes on Káfirstán. Journal of the Asiatic Society of Bengal, **28:** 317–368.

Rawlins, R. G. 1979. Parturient and postpartum behavior of a free-ranging rhesus monkey (*Macaca mulatta*). Journal of Mammalogy, **60:** 432–433.

Rawlins, R. G., and M. J. Kessler. 1983. Congenital and hereditary anomalies in the rhesus monkeys (*Macaca mulatta*) of Cayo Santiago, Teratology, **28:** 169–174.

———. 1986a. Secondary sex ratio variation in the Cayo Santiago macaque population. American Journal of Primatology, **10:** 9–23.

———. 1986b. The history of the Cayo Santiago colony, pp. 13–45. *In* Rawlins, R. G., and M. J. Kessler, eds., The Cayo Santiago Macaques: History, Behavior and Biology. State University of New York Press, Albany.

———. 1986c. Demography of the free-ranging Cayo Santiago macaques (1976–1983), pp. 47–72. *In* Rawlins, R. G., and M. J. Kessler, eds., The Cayo Santiago Macaques: History, Behavior and Biology. State University of New York Press, Albany.

Rawlins, R. G., M. J. Kessler, and J. E. Turnquist. 1984. Reproductive performance, population dynamics and anthropometrics of the free-ranging Cayo Santiago rhesus macaques. Journal of Medical Primatology, **13:** 247–259.

Remfry, J. 1982. The endoparasites of rhesus monkeys (*Macaca mulatta*) before and after capture. Microbiologica, **5:** 143–147.

Richard, A. F., S. J. Goldstein, and R. W. Dewar. 1989. Weed macaques: The evolutionary implications of macaque feeding ecology. International Journal of Primatology, **10:** 569–594.

Richie, T., R. Shrestha, J. Teas, H. Taylor, and C. H. Southwick. 1978. Rhesus monkeys at high altitudes in northwestern Nepal. Journal of Mammalogy, **59:** 443–444.

Rickett, C. B., and J. D. de La Touche. 1896. Additional observations on the birds of the province of Fohkien. Ibis, 7th series, **2:** 489–495.

Rifkin, A., J. Mann, and P. O'Neill-Wagner. 1999. Male mate choice and social rank in *Macaca mulatta*. American Journal of Primatology, **49:** 92-93 (abstract only)

Riopelle, A. J. 1980. Development of swimming in neonatal rhesus monkeys. Antropologia Contemporanea, **3:** 262. (abstract only)

Riopelle, A. J., L. S. Dietz, J. P. Geaghan, and T. C. Storms. 1986. Perinatal weight loss and recovery in well-nourished rhesus monkeys. Human Biology, **58:** 907–918.

Riopelle, A. J., and P. A. Hale. 1975. Nutritional and environmental factors affecting gestation length in rhesus monkeys. American Journal of Clinical Nutrition, **28:** 1170–1176.

Roberts, T. J. 1977. The Mammals of Pakistan. Ernest Benn, London, 361 pp.

Rock, J. F. 1925. The land of the yellow lama: National Geographic Society explorer visits the strange kingdom of Muli, beyond the Likiang Snow Range of Yünnan Province, China. National Geographic Magazine, **47:** 447–492.

———. 1926. Through the great river trenches of Asia: National Geographic Society explorer follows the Yangtze, Mekong, and Salwin through mighty gorges, some of whose canyon walls tower to a height of more than two miles. National Geographic Magazine, **50:** 133–186.

Rode, P. 1938. Catalogue des types de mammifères du Muséum National d'Histoire Naturelle. I. Ordre des primates. A.—Sous-ordre des simiens. Bulletin du Muséum National d'Histoire Naturelle, Paris, 2nd series, **10:** 202–251.

Rodriguez, A. A. 1998. Neutral tail position among adult rhesus macaques (*Macaca mulatta*) on Cayo Santiago: Relations to dominance and rank, abstract no. 307. Abstracts from the XVIIth Congress of the International Primatological Society. University of Antananarivo, Antananarivo, not paginated. (abstract only)

Roonwal, M. L. 1949. Systematics, ecology and bionomics of mammals studied in connection with tsutsugamushi disease (scrub typhus) in the Assam-Bur-

ma war theatre during 1945. Transactions of the National Institute of Sciences of India, **3:** 67–122.

———. 1950. Contributions to the fauna of Manipur State, Assam. Part III.—Mammals, with special reference to the family Muridae (order Rodentia). Records of the Indian Museum, **47:** 1–64. (For date of publication, see table of contents.)

———. 1956. Macaque monkey eating mushrooms. Journal of the Bombay Natural History Society, **54:** 171.

Roonwal, M. L., and S. M. Mohnot. 1977. Primates of South Asia: Ecology, Sociobiology, and Behavior. Harvard University Press, Cambridge, Massachusetts, xix + 421 pp.

Roonwal, M. L., and P. C. Tak. 1981. A field study of subspecific variation in tail form and carriage in the rhesus macaque, *Macaca mulatta* (Primates), in South Asia. Bulletin of the Zoological Survey of India, **4:** 95–101.

Ross, C. 1988. The intrinsic rate of natural increase and reproductive effort in primates. Journal of Zoology, **214:** 199–219.

Ross, C., and A. Srivastava. 1994. Factors influencing the population density of the Hanuman langur (*Presbytis entellus*) in Sariska Tiger Reserve. Primates, **35:** 361–367.

Ross, C., A. Srivastava, and R. S. Pirta. 1993. Human influences on the population density of Hanuman langurs *Presbytis entellus* and rhesus macaques *Macaca mulatta* in Shimla, India. Biological Conservation, **65:** 159–163.

Rowell, T. E. 1963. Behaviour and reproductive cycles of female macaques. Journal of Reproduction and Fertility, **6:** 193–203.

Ruggeri, N., and R. J. Timmins. 1997. An initial summary of diurnal primate status in Laos. Asian Primates, **5**(3–4): ii, 1–3. (For date of publication, see p. 29).

Ruiz de Elvira, M. C., J. G. Herndon, and M. E. Wilson. 1982. Influence of estrogen-treated females on sexual behavior and male testosterone levels of a social group of monkeys during the nonbreeding season. Biology of Reproduction, **26:** 825–834.

Ryley, K. V. 1914. Bombay Natural History Society's Mammal Survey of India, Burma and Ceylon. Report No. 14. Journal of the Bombay Natural History Society, **22:** 710–725.

Sade, D. S. 1964. Seasonal cycle in size of testes of free-ranging *Macaca mulatta*. Folia Primatologica, **2:** 171–180.

———. 1967. Determinants of dominance in a group of free-ranging rhesus monkeys, pp. 99–114. *In* Altmann, S. A., ed., Social Communication among Primates. University of Chicago Press, Chicago.

———. 1968. Inhibition of son-mother mating among free-ranging rhesus monkeys, pp. 18–38. *In* Masserman, J. H., ed., Animal and Human: Scientific Proceedings of the American Academy of Psychoanalysis. Grune & Stratton, New York.

———. 1971. Communication by tail positions in rhesus monkeys (*Macaca mulatta*). American Journal of Physical Anthropology, **35:** 294. (abstract only)

———. 1972. A longitudinal study of social behavior of rhesus monkeys, pp. 378–398. *In* Tuttle, R. A., ed., Functional and Evolutionary Biology of Primates. Aldine-Atherton, Chicago.

———. 1980. Population biology of free-ranging rhesus monkeys on Cayo Santiago, Puerto Rico, pp. 171–187. *In* Cohen, M. N., R. S. Malpass, and H. G. Klein, eds., Biosocial Mechanisms of Population Regulation. Yale University Press, New Haven, Connecticut.

———. 1985. Management of the colony, pp. 17–30. *In* Sade, D. S., B. D. Chepko-Sade, J. M. Schneider, S. S. Roberts, and J. T. Richtsmeier, eds., Basic Demographic Observations on Free-Ranging Rhesus Monkeys, Volume 1. Human Relations Area Files, New Haven, Connecticut.

Sade, D. S., K. Cushing, P. Cushing, J. Dunaif, A. Figueroa, J. R. Kaplan, C. Lauer, D. L. Rhodes, and J. M. Schneider. 1977. Population dynamics in relation to social structure on Cayo Santiago. Yearbook of Physical Anthropology, **20:** 253–262.

Sade, D. S., D. L. Rhodes, J. Loy, G. Hausfater, J. A. Breuggeman, J. R. Kaplan, B. D. Chepko-Sade, and K. C. Kaplan. 1984. New findings on incest among free-ranging rhesus monkeys. American Journal of Physical Anthropology, **63:** 212–213. (abstract only)

Saha, S. S. 1974. Notes on the fate of a dominant male of rhesus monkey, *Macaca mulatta* (Zimmermann) in a group. Journal of the Zoological Society of India, **24:** 211–212. (For date of publication, see outside front cover.)

Sahibzada, S. S., Q. A. Igbal, and A. Rab. 1985. Mother infant relationship in free ranging rhesus monkey (*Macaca mulatta*). Pakistan Journal of Scientific and Industrial Research, **28:** 198–204.

Sanderson, I. T. 1957. The Monkey Kingdom: An Introduction to the Primates. Hanover House, Garden City, New York, 200 pp.

Sanyal, P. 1983. Mangrove tiger land: The Sundarbans of India. Tigerpaper, **10**(3): 1–4.

Saxton, J. L., and W. G. Lotz. 1990. Growth of rhesus monkeys during the first 54 months of life. Journal of Medical Primatology, **19:** 119–136.

Scanlan, J. M., R. Maclin, C. Ripp, and S. J. Suomi. 1985. Birthweight and neonatal mortality in rhesus monkeys (*Macaca mulatta*). American Journal of Primatology, **8:** 363. (abstract only)

Schäfer, E. 1933. Berge Buddhas und Bären: Forschung und Jagd in Geheimnisvollem Tibet. Verlag von Paul Parey, Berlin, 315 pp.

———. 1942. Tibet Ruft: Forschung und Jagd in den Hochgebirgen Osttibets, Tibetexpedition 1931/32. Verlag von Paul Parey, Berlin, 290 pp.

Schinz, H. R. 1821. Das Thierreich. . .. Volume 1. J. G. Cotta'schen Buchhandlung, Stuttgart, xxxviii + 894 pp.

Schmitt, J., and J. Tomiuk. 1995. Protein polymorphism in three cercopithecid species and its application to conservation. Folia Primatologica, **63:** 123–130. (For date of publication, see outside front cover.)

Schneiderman, E. D. 1933. Facial growth in rhesus monkey: A longitudinal cephalometric study. Princeton University Press, Princeton, NJ, xiii + 217 pp.

Schreber, J. C. D. [1800]. *Simia Erythraea*, Suppl. pl. VIII C. *In* Schreber, J. C. D., A. Goldfuss, and J. A. Wagner, Die Saugthiere in Abbildungen nach der Nature mit Beschreibungen, Th. V. Wolfgang Walther, Erlangen. (For date of publication, see Sherborn, C. D., 1892, Proceedings of the Zoological Society of London, **1891:** 587, 590.)

Schultz, A. H. 1933. Growth and development, pp. 10–27. *In* Hartman, C. G., and W. L. Strauss, Jr., eds., The Anatomy of the Rhesus Monkey (*Macaca mulatta*). Williams & Wilkins Company, Baltimore.

———. 1935. Eruption and decay of the permanent teeth in primates. American Journal of Physical Anthropology, **19:** 489-581.

———. 1937. Fetal growth and development of the rhesus monkey. Contributions to Embryology, **26:** 71–97.

Schwartz, S. M., M. E. Wilson, M. L. Walker, and D. C. Collins. 1988. Dietary influences on growth and sexual maturation in premenarchial rhesus monkeys. Hormones and Behavior, **22:** 231–251.

Sclater, P. L. 1871. Notes on rare or little-known animals now or lately living in the Society's Gardens. Part I. Mammalia. Proceedings of the Zoological Society of London, **1871:** 221–240.

———. 1881. Report of additions made to the Society's Menagerie during the months of June, July, August, September and October 1880. Proceedings of the Zoological Society of London, *1880:* 537–539. (For date of publication, see Duncan, F. M., 1937, Proceedings of the Zoological Society of London, **107**, Series A: 73.)

Scully, J. 1888. On the Chiroptera of Nepal. Journal of the Asiatic Society of Bengal, **56**(Part II.—Natural Science): 233–259.

Seeley, T. D., R. H. Seeley, and Pongthep Akratanakul. 1982. Colony defense strategies of the honeybees in Thailand. Ecological Monographs, **52:** 43–63.

Serrao, J. S., and S. R. Amladi. 1979. Of macaques—Bonnet and rhesus. Hornbill, **12:** 29–32.

Seth, P. K., and S. Seth. 1983. Population dynamics of free-ranging rhesus monkeys in different ecological conditions in India. American Journal of Primatology, **5:** 61–67.

———. 1985. Ecology and feeding behaviour of the free ranging rhesus monkeys in India. Indian Anthropologist, **15:** 51–62.

———. 1993. Structure, function and diversity of Indian rhesus monkeys, pp. 47–81. *In* Seth, P. K., and S. Seth, eds., New Perspectives in Anthropology. M D Publications, New Delhi.

Seth, P. K., S. Seth, G. L. Reddy, and P. K. Chopra. 1992. Population trends in naturally occurring rhesus monkey populations in different habitats in India. Primate Report, **32:** 61–73.

Seth, P. K., S. Seth, and A. K. Shukla. 1983. Sociobiology of free ranging rhesus monkeys, pp. 37–44. *In* Seth, P. K., ed., Perspectives in Primate Biology. Today & Tomorrow's Printers, New Delhi.

Seth, S., P. K. Seth, G. J. Reddy, and P. K. Chopra. 1986. Fissioning pattern in free ranging rhesus monkeys. Primate Report, **14:** 115. (abstract only)

Shah, K. V., and C. H. Southwick. 1965. Prevalence of antibodies to certain viruses in sera of free-living rhesus and of captive monkeys. Indian Journal of Medical Research, **53:** 488–500.

Sharma, D. N., and K. C. Lal. 1986. Age-related growth patterns of colony-born rhesus monkeys, pp. 141–146. *In* Else, J. G., and P. C. Lee, eds., Primate Ontogeny, Cognition and Social Behaviour. Cambridge University Press, Cambridge.

Sharma, M. B., and P. K. Seth. 1984. Chromosomal variations in *Macaca mulatta* (rhesus monkey). International Journal of Primatology, **5:** 380. (abstract only)

Shaughnessy, P. W., R. F. DiGiacomo, D. P. Martin, and D. A. Valerio. 1978. Prematurity and perinatal mortality in the rhesus (*Macaca mulatta*): Relationship to birth weight and gestational age. Biologia Neonatorum, **34:** 129–145.

Shaw, G. 1800. General Zoology or Systematic Natural History. Volume I., Part 1. Mammalia. G. Kearsley, London, xiii + 248 pp.

Sheeran, L. K., and F. E. Poirier. 1994. The black-crested gibbon of China. Primate Conservation, **11:** 20–22. (For date of publication, see p. 3.)

Shen Xiaozhou. 1963. Faunal characteristics of Tibetan mammals and the history of their organization. Acta Zoologica Sinica, **15:** 139–150. (in Chinese, Russian summary)

Sherborn, C. D. 1892. On the dates of the parts, plates, and text of Schreber's "Säugthiere." Proceedings of the Zoological Society of London, **1891:** 587–592. (For date of publication, see Duncan, F. M., 1937, Proceedings of the Zoological Society of London, **107**, Series A: 74.)

Shimizu, K., and O. Takenaka. 1991a. DNA polymorphisms in the $\psi\beta_1$- and β-globin gene regions in Asian macaques. Biochemical Genetics, **29:** 177–187.

———. 1991b. DNA polymorphisms in the ϵ- and γ-globin gene regions in Asian macaques. Biochemical Genetics, **29:** 189–202.

Shively, C., S. Clarke, N. King, S. Schapiro, and G. Mitchell. 1982. Patterns of sexual behavior in male macaques. American Journal of Primatology, **2:** 373–384.

Shou Zhenhuang, Li Yangwen, and Kan Shengyun. 1964. Cercopithecidae, pp. 59–70. *In* Shou Zhenhuang, ed., Account of the Economic Animals of China: Class Mammalia. Science Press, Beijing. (in Chinese)

Shrestha, N. 1997. News from the Himalaya. Asian Primates, **6**(1–2): 31. (For date of publication, see p. 36.)

Shrestha, T. K. 1981. Wildlife of Nepal: A Study of Renewable Resources of Nepal Himalayas. Curriculum Development Centre, Tribhuvan University, Kathmandu, 734 pp.

Shukla, A. K., P. K. Seth, and S. Seth. 1984. Population trends of rhesus monkeys (*Macaca mulatta*) in a tropical urban habitat of North India; pp. 19–21. *In* Roonwal, M. L., S. M. Mohnot, and N. S. Rathore, eds., Current Primate Researches. Department of Zoology, University of Jodhpur, Jodhpur.

Siddiqi, M. F., and C. H. Southwick. 1980. Feeding behaviour of rhesus monkeys (*Macaca mulatta*) in the

North Indian plains. Proceedings of the Zoological Society, Calcutta, **31:** 53–61. (For date of publication, see unnumbered page opposite table of contents.)

———. 1988. Food habits of rhesus monkeys (*Macaca mulatta*) in the North Indian plains, pp. 113–123. *In* Fa, J. E., and C. H. Southwick, eds., Ecology of Food-Enhanced Primate Groups. Alan R. Liss, New York.

Sikorska-Piwowska, Z. 1959. Preliminary report on the varieties of the species *Macaca rhesus* (Audeb.) and *M. cynomolgus* (Reich.). Przegląd Zoologiczny, **3:** 271–272. (in Polish, English summary)

———. 1970. Sexual dimorphism in primate ontogenesis, described from skull morphology of macaques, and its role in speciation. Zoologica Poloniae, **20:** 5–27.

Silk, J., J. Short, J. Roberts, and J. Kusnitz. 1993. Gestation length in rhesus macaques (*Macaca mulatta*). International Journal of Primatology, **14:** 95–104.

Simpson, A. E., and M. J. A. Simpson. 1985. Short-term consequences of different breeding histories for captive rhesus macaque mothers and young. Behavioral Ecology and Sociobiology, **18:** 83–89.

Simpson, M. J. A., and A. E. Simpson. 1982. Birth sex ratio and social rank in rhesus monkey mothers. Nature, **300:** 440.

Simpson, M. J. A., and A. Tartabini. 1992. Control of nipple and body contact by mothers and infants in rhesus macaques. Folia Primatologica, **59:** 26–32.

Singh, A. N. 1982. A survey of the mammalian fauna of the Kedarnath Sanctuary, Uttar Pradesh (India). Tigerpaper, **9**(1): 7–10.

Singh, M. 1975. Mother-infant separation in rhesus monkey living in natural environment. Primates, **16:** 471–476.

Singh, M., and R. S. Pirta. 1983. Field experiments and observations on rhesus and bonnet monkeys: A case for primate sociobiology, pp. 81–88. *In* Seth, P. K., ed., Perspectives in Primate Biology. Today & Tomorrow's Printers, New Delhi.

Singh, R. 1984. Initial dyadic social behavior in free-ranging rhesus monkeys (*Macaca mulatta*). Proceedings of the Indian Academy of Sciences (Animal Sciences), **93:** 49–54.

———. 1986. Ontogeny of play behavior in free-ranging rhesus macaques (*Macaca mulatta*). Proceedings of the Indian Academy of Sciences (Animal Sciences), **95:** 605–612.

———. 1989. Ontogeny of aggressive and submissive behaviour in free living rhesus monkeys (*Macaca mulatta*). Proceedings of the Indian Academy of Sciences (Animal Sciences), **98:** 139–148.

———. 1992. Ontogeny of behavioral dynamics among free-ranging rhesus monkeys (*Macaca mulatta*): Theory and observation, pp. 187–200. *In* Seth, P. K., and S. Seth, eds., Perspectives in Primate Biology: Volume 4. Primates—The New Revolution. Today & Tomorrow's Printers and Publishers, New Delhi.

Singh, R., S. N. Sinha, and V. P. Dixit. 1984. Validation of dominance measures in free-ranging rhesus monkeys (*Macaca mulatta*): A multivariate analysis, pp. 263–270. *In* Roonwal, M. L., S. M. Mohnot, and N. S. Rathore, eds., Current Primate Researches. Department of Zoology, University of Jodhpur, Jodhpur.

Singh, R. K. 1984. Maternal communication of primaparous and multiparous rhesus monkeys (*Macaca mulatta*), pp. 429–434. *In* Roonwal, M. L., S. M. Mohnot, and N. S. Rathore, eds., Current Primate Researches. Department of Zoology, University of Jodhpur, Jodhpur.

Singh, R. K., and N. N. Sen. 1977–78. A note on adoption of two rhesus juveniles by a langur group. Journal of Scientific Research, Banaras Hindu University, **28:** 135–138.

Sinha, N. K. 1977. Mammals of Bandhavgarh National Park, Shahdol District, Madhya Pradesh. Newsletter, Zoological Society of India, **3:** 3–7.

Small, M. F. 1981. Body fat, rank, and nutritional status in a captive group of rhesus macaques. International Journal of Primatology, **2:** 91–95.

Small, M. F., and S. B. Hrdy. 1986. Secondary sex ratios by maternal rank, parity, and age in captive rhesus macaques (*Macaca mulatta*). American Journal of Primatology, **11:** 359–365.

Small, M. F., and D. G. Smith. 1985. Sex of infants produced by male rhesus macaques. American Naturalist, **126:** 354–361.

———. 1986. The influence of birth timing upon infant growth and survival in captive rhesus macaques (*Macaca mulatta*). International Journal of Primatology, **7:** 289–304.

Small, M. F., R. Stanyon, D. G. Smith, and L. Sineo. 1985. High-resolution chromosomes of rhesus macaques (*Macaca mulatta*). American Journal of Primatology, **9:** 63–67.

Smith, B. H., T. L. Crummett, and K. L. Brandt. 1994. Ages of eruption of primate teeth: A compendium for aging individuals and comparing life histories. Yearbook of Physical Anthropology, **37:** 177-231.

Smith, C. H. 1842. The Naturalists Library. Introduction to the Mammalia, Volume 13. W. H. Lizars, Edinburgh, 313 pp.

Smith, D. G. 1980. Paternity exclusion in six captive groups of rhesus monkeys (*Macaca mulatta*). American Journal of Physical Anthropology, **53:** 243–249.

———. 1981. The association between rank and reproductive success of male rhesus monkeys. American Journal of Primatology, **1:** 83–90.

———. 1982. Inbreeding in three captive groups of rhesus monkeys. American Journal of Physical Anthropology, **58:** 447–451.

———. 1986a. Inbreeding in the maternal and paternal lines of four captive groups of rhesus monkeys (*Macaca mulatta*), pp. 214–225. *In* Taub, D. M., and F. A. King, eds., Current Perspectives in Primate Biology. Van Nostrand Reinhold Co., New York.

———. 1986b. Incidence and consequences of inbreeding in three captive groups of rhesus macaques (*Macaca mulatta*), pp. 857–874. *In* Benirschke, K., ed., Primates: The Road to Self-Sustaining Populations. Springer-Verlag, New York.

———. 1993. A 15-year study of the association between dominance rank and reproductive success of male rhesus macaques. Primates, **34:** 471–480.

———. 1994a. Genetic heterogeneity in five captive specific pathogen-free groups of rhesus macaques. Laboratory Animal Science, **44:** 200–210.

———. 1994b. Male dominance and reproductive success in a captive group of rhesus macaques (*Macaca mulatta*). Behaviour, **129:** 225–242.

———. 1994c. Influence of regional crossbreeding between rhesus macaques on the rate of weight gain of their offspring. Zoo Biology, **13:** 277–284.

———. 1995. Avoidance of close consanguineous inbreeding in captive groups of rhesus macaques. American Journal of Primatology, **35:** 31–40.

Smith, D. G., F. W. Lorey, J. Suzuki, and M. Abe. 1987. Effect of outbreeding on weight and growth rate of captive infant rhesus macaques. Zoo Biology, **6:** 201–212.

Smith, D. G., and S. Smith. 1988. Parental rank and reproductive success of natal rhesus males. Animal Behaviour, **36:** 554–562.

Smith, F. T. 1926. The Fukien Scientific Expedition. China Journal of Science and Arts, **5:** 128–131.

Southwick, C. H. 1962. Patterns of intergroup social behavior in primates, with special reference to rhesus and howling monkeys. Annals of the New York Academy of Sciences, **102:** 436–454.

———. 1985. Some encouraging signs from India's rhesus populations. American Journal of Primatology, **8:** 191.

Southwick, C. H., and M. A. Beg. 1961. Social behavior of rhesus monkeys in a temple habitat in northern India. American Zoologist, **1:** 390–391

Southwick, C. H., M. A. Beg, and M. R. Siddiqi. 1961a. A population survey of rhesus monkeys in villages, towns and temples of northern India. Ecology, **42:** 538–547.

———. 1961b. A population survey of rhesus monkeys in northern India: II. Transportation routes and forest areas. Ecology, **42:** 698–710.

———. 1965. Rhesus monkeys in North India, pp. 111–159. *In* DeVore, I., ed., Primate Behavior: Field Studies of Monkeys and Apes. Holt, Rinehart and Winston, New York.

Southwick, C. H., A. Ghosh, and C. D. Louch. 1964. A roadside survey of rhesus monkeys in Bengal. Journal of Mammalogy, **45:** 443–448.

Southwick, C. H., and D. Manry. 1987. Habitat and population changes for the Kowloon macaques. Primate Conservation, **8:** 48–49.

Southwick, C. H., T. L. Richie, H. Taylor, J. Teas, and M. F. Siddiqi. 1980. Rhesus monkey populations in India and Nepal: Patterns of growth, decline and natural regulation, pp. 151–170. *In* Cohen, M. N., R. S. Malpass, and H. G. Klein, eds., Biosocial Mechanisms of Population Regulation. Yale University Press, New Haven, Connecticut.

Southwick, C. H., and M. F. Siddiqi. 1977. Population dynamics of rhesus monkeys in northern India, pp. 339–362. *In* H. S. H. Prince Rainer III and G. H. Bourne, eds., Primate Conservation. Academic Press, New York.

———. 1983. Status and conservation of rhesus monkeys in India, pp. 227–236. *In* Seth, P. K., ed., Perspectives in Primate Biology. Today & Tomorrow's Printers, New Delhi.

———. 1984. A proposal for the conservation of rhesus monkeys in agricultural habitats of northern India, pp. 553–561. In Roonwal, M. L., S. M. Mohnot, and N. S. Rathore, eds., Current Primate Researches. Department of Zoology, University of Jodhpur, Jodhpur.

———. 1988. Partial recovery and a new population estimate of rhesus monkey populations in India. American Journal of Primatology, **16:** 187–197.

———. 1994a. Primate commensalism: The rhesus monkey in India. Revue d'Écologie (Terre & Vie), **49:** 223–231.

———. 1994b. Population status of nonhuman primates in Asia, with emphasis on rhesus macaques in India. American Journal of Primatology, **34:** 51–59.

———. 1995. Primates in Asia: Survival in a competitive world. Primate Report, **41:** 15–22.

Southwick, C. H., M. F. Siddiqi, M. Y. Farooqui, and B. C. Pal. 1974. Xenophobia in free-ranging rhesus groups in India, pp. 185–209. *In* Holloway, R. L., Jr., ed., Primate Aggression, Territoriality, and Xenophobia. Academic Press, New York.

———. 1976. Effects of artificial feeding on aggressive behaviour of rhesus monkeys in India. Animal Behaviour, **24:** 11–15.

Southwick, C. H., M. F. Siddiqi, and R. L. Johnson. 1986. Demographic effects of home range displacement on monkeys at Chhatari. American Journal of Primatology, **10:** 433. (abstract only)

Southwick, C. H., M. F. Siddiqi, and J. R. Oppenheimer. 1983. Twenty-year changes in rhesus monkey populations in agricultural areas of northern India. Ecology, **64:** 434–439.

Southwick, C. H., and M. R. Siddiqi. 1966. Population changes of rhesus monkeys (*Macaca mulatta*) in India, 1959 to 1965. Primates, **7:** 303–314.

Southwick, C. H., and K. L. Southwick. 1983. Polyspecific groups of macaques on the Kowloon Peninsula, New Territories, Hong Kong. American Journal of Primatology, **5:** 17–24.

———. 1985. Rhesus monkeys in Burma, Primate Conservation, **5:** 35–36.

Southwick, C. H., J. Teas, T. L. Richie, and H. Taylor. 1982. Ecology and behavior of rhesus monkeys (*Macaca mulatta*) in Nepal. National Geographic Society Research Reports, **14:** 619–630.

Southwick, C. H., Zhang Yongzu, Jiang Haisheng, Liu Zhenhe, and Qu Wenyuan. 1996. Population ecology of rhesus macaques in tropical and temperate habitats in China, pp. 95–105. *In* Fa, J. E., and D. G. Lindburg, eds., Evolution and Ecology of Macaque Societies. Cambridge University Press, New York.

Southwick, C. H., Zhang Yongzu, Jiang Haisheng, and Qu Wenyuan. 1991. Comparative ecology of rhesus populations at latitudinal extremes in China, pp. 25–28. *In* Ehara, A., T. Kimura, O. Takenaka, and M. Iwamoto, eds., Primatology Today. Elsevier Science Publishers, Amsterdam.

Sowerby, A. de C. 1925. A Naturalist's Note-Book in China. North-China Daily News & Herald, Shanghai, 270 pp.

———. 1929. A new monkey from China. China Journal, **11:** 315.

———. 1939. A review of the mammals of China and Mongolia. China Journal, **30:** 224–236.

———. 1941. Apes, monkeys and lemurs of China. China Journal, **34:** 259–265.

Spillett, J. J. 1967. A report on wild life surveys in North India and southern Nepal, January–June 1966. Journal of the Bombay Natural History Society, **63:** 492–628. (For date of publication, see table of contents.)

———. 1968. A report on wild life surveys in South and West India, November–December 1966. Journal of the Bombay Natural History Society, **65:** 1–46.

Srikosamatara, S. 1993. Density and biomass of large herbivores and other mammals in a dry tropical forest, western Thailand. Journal of Tropical Ecology, **9:** 33–43.

Stanford, C. B. 1991. The capped langur in Bangladesh: Behavioral ecology and reproductive tactics. Contributions to Primatology, **26:** vii–xvii, 1–179.

———. 1992. Comparative ecology of the capped langur *Presbytis pileata* Blyth in two forest types in Bangladesh. Journal of the Bombay Natural History Society, **89:** 187–193.

Stern, B. R., and D. G. Smith. 1984. Sexual behaviour and paternity in three captive groups of rhesus monkeys (*Macaca mulatta*). Animal Behaviour, **32:** 23–32.

Stevens, H. 1934. Through Deep Defiles to Tibetan Uplands: The Travels of a Naturalist from the Irrawaddy to the Yangtse. H. F. & G. Witherby, London, 250 pp.

Stewart, T. D. 1933. The skin and its appendages, pp. 28-35. *In* Hartman, C. G., and W. L. Straus, Jr., eds., The Anatomy of the Rhesus Monkey (*Macaca mulatta*). Williams & Wilkins, Baltimore.

Stiles, C. W., and M. O. Nolan. 1929. Key catalogue of primates for which parasites are reported. U.S. Hygienic Laboratory Bulletin, No. **152:** 409–601.

Stone, W. 1933. Zoological results of the Dolan West China Expedition of 1931,—Part 1. Birds. Proceedings of the Academy of Natural Sciences of Philadelphia, **85:** 165–222.

Strahan, R., P. J. Newman, and R. T. Mitchell. 1973. Times of birth of thirty mammal species, bred in the zoos of London and Sydney. International Zoo Yearbook, **13:** 384–386.

Strum, S. C., and C. H. Southwick. 1986. Translocation of primates, pp. 949–957. *In* Benirschke, K., ed., Primates: The Road to Self-Sustaining Populations. Springer-Verlag, New York.

Su Bing, Wang Wen, Lan Hong, and Zhang Yaping. 1997. Genetic diversity and phylogenetic relationships among Chinese *Macacas* based on protein electrophoresis. Acta Genetica Sinica, **24:** 109–115.

Subba, P. B., and C. Santiapillai. 1991–92. Golden langur in the Royal Manas National Park of Bhutan. Primate Conservation, **10:** 31–32. (For date of publication, see p. 3.)

Subrahmanyam, R. 1975. Nagarjunakonda (1954–60), Volume I. Introduction. Memoirs of the Archaeological Survey of India, **75:** xvii–xxiii.

Sugiyama, Y. 1976. Characteristics of the ecology of the Himalayan langurs. Journal of Human Evolution, **5:** 249–277.

Sultana, C. J., and B. M. Marriott. 1982. Geophagia and related behavior of rhesus monkeys (*Macaca mulatta*) on Cayo Santiago Island, Puerto Rico. International Journal of Primatology, **3:** 338. (abstract only)

Swinhoe, R. 1863. On the mammals of the Island of Formosa (China). Proceedings of the Zoological Society of London, **1862:** 347–365. (For date of publication, see Duncan, F. M., 1937, Proceedings of the Zoological Society of London, **107,** Series A: 72.)

———. [1867]. Letter to the secretary respecting a monkey from the Island of North Lena, near Hongkong. Proceedings of the Zoological Society of London, *1866:* 556. (For date of publication, see Duncan, F. M., 1937, Proceedings of the Zoological Society of London, **107**, Series A: 72.)

———. 1870. On the mammals of Hainan. Proceedings of the Zoological Society of London, **1870:** 224–239.

———. [1871]. Catalogue of the mammals of China (south of the River Yangtze) and of the Island of Formosa. Proceedings of the Zoological Society of London, **1870:** 615–653. (For date of publication, see Duncan, F. M., 1937, Proceedings of the Zoological Society of London, **107**, Series A: 72.)

Szalay, F. S., and E. Delson. 1979. Evolutionary History of the Primates. Academic Press, New York, xiv + 580 pp.

Tak, C., and G. Kumar. 1984. Field observations on tail carriage in two primates from the Kashmir Valley, India (the langur, *Presbytis entellus* and the macaque, *Macaca mulatta*), pp. 201–206. *In* Roonwal, M. L., S. M. Mohnot, and N. S. Rathore, eds., Current Primate Researches. Department of Zoology, University of Jodhpur, Jodhpur.

Tan Bangjie. 1985. The status of primates in China. Primate Conservation, **5:** 63–81.

Tan Bangjie, and F. E. Poirier. [1991]. Status report on some Chinese primates. Primate Conservation, **9:** 129–131. (For date of publication, see Asian Primates, 1991, **1**[1]: 1.)

Tan Manni. 1988. Hainan—"China's Hawaii." China Reconstructs, **37**(12): 13–14.

Tang Changzhu, Ma Yong, Wang Jiajun, Wang Ziyu, and Zhou Naiwu. 1965. [Fauna of birds and mammals in the Zhongtiao District, Shanxi]. Acta Zoologica Sinica, **17:** 86–102. (in Chinese, Russian summary)

Tate, G. H. H. 1947. Mammals of Eastern Asia. Macmillan, New York, xiv + 366 pp.

Taub, D. M., and P. T. Mehlman. 1989. Development of the Morgan Island rhesus monkey colony. Puerto Rico Health Sciences Journal, **8:** 159–169.

Taylor, H. G., J. Teas, T. L. Richie, C. H. Southwick, and R. Shrestha. 1978. Social interactions between adult male and infant rhesus monkeys in Nepal. Primates, **19:** 343–351.

Taylor, L. L. 1994. Sex ratios for births and stillbirths in a new SPF rhesus monkey colony. American Journal of Primatology, **33:** 244. (abstract only)

Teas, J. 1983. Ecological considerations important in the interpretation of census data on free-ranging monkeys

in Nepal, pp. 211–225. *In* Seth, P. K., ed., Perspectives in Primate Biology. Today & Tomorrow's Printers, New Delhi.

———. 1984. Rhesus monkeys aggression and grooming social dynamics, pp. 237–247. *In* Small, M. F., ed., Female Primates: Studies by Women Primatologists. Alan R. Liss, New York.

Teas, J., H. A. Feldman, T. L. Richie, H. G. Taylor, and C. H. Southwick. 1982. Aggressive behavior in the free-ranging monkeys of Kathmandu, Nepal. Aggressive Behavior, **8:** 63–77.

Teas, J., T. L. Richie, H. G. Taylor, M. F. Siddiqi, and C. H. Southwick. 1981a. Natural regulation of rhesus monkey populations in Kathmandu, Nepal: Rhesus monkey groups near Kathmandu, Nepal, show demographic patterns of intrinsic population stability. Folia Primatologica, **35:** 117–123.

Teas, J., T. L. Richie, H. G. Taylor, and C. H. Southwick. 1980. Population patterns and behavioral ecology of rhesus monkeys (*Macaca mulatta*) in Nepal, pp. 247–262. *In* Lindburg, D. G., ed., The Macaques: Studies in Ecology, Behavior and Evolution. Van Nostrand Reinhold, New York.

Teas, J., H. G. Taylor, T. L. Richie, R. D. Shresta, G. K. Turner, and C. H. Southwick. 1981b. Parturition in rhesus monkeys (*Macaca mulatta*). Primates, **22:** 580–586.

Teilhard de Chardin, P., and C. C. Young. 1936. On the mammalian remains from the archaeological site of Anyang. Palaeontologia Sinica, Series C, **12:** 5–78.

Thomas, O. 1899. On mammals collected by Mr. J. D. La Touche at Kuatun, N. W. Fokien, China. Proceedings of the Zoological Society of London, **1898:** 769–775. (For date of publication, see Duncan, F. M., 1937, Proceedings of the Zoological Society of London, **107**, Series A: 75.)

Tikader, B. K. 1983. Threatened Animals of India. Zoological Survey of India, Calcutta, 307 pp.

Tilford, B. 1981. Nondesertion of a postreproductive rhesus female by adult male kin. Journal of Mammalogy, **62:** 638–639.

Tilson, R. L. 1983. The western limit of pigtail macaque distribution in Assam. Journal of the Bombay Natural History Society, **79:** 399–400. (For date of publication, see table of contents.)

Tinklepaugh, O. L. 1933. The nature of periods of sex desire in woman and their relation to ovulation. American Journal of Obstetrics and Gynecology, **26:** 335–345.

Tinklepaugh, O. L., and C. G. Hartman. 1930. Behavioral aspects of parturition in the monkey (*Macacus rhesus*). Journal of Comparative Psychology, **11:** 63–98.

———. 1932. Behavior and maternal care of the newborn monkey (*Macaca mulatta*—"*M. rhesus*"). Journal of Genetic Psychology, **40:** 257–285.

Tiwari, J. P., and A. K. Shukla. 1984. Microbiological investigation of the rhesus macaque, *Macaca mulatta*, in an urban setting in Uttar Pradesh, India, pp. 497–499. *In* Roonwal, M. L., S. M. Mohnot, and N. S. Rathore, eds., Current Primate Researches. Department of Zoology, University of Jodhpur, Jodhpur.

Tomaszycki, M., C. Cline, B. Griffin, D. Maestripieri, and W. D. Hopkins. 1998. Maternal cradling and infant nipple preferences in rhesus monkeys (*Macaca mulatta*). Developmental Psychobiology,*32:* 305–312.

Tong Guobang, and Shao Shixiong. 1991. The evolution of Quaternary climate in China, pp. 43–76. *In* Zhang Zonghu, ed., The Quaternary of China. China Ocean Press, Beijing.

Tong Guobang, and Zhang Junpai. 1991. Quaternary palynoflora of China, pp. 375–391. *In* Zhang Zonghu, ed., The Quaternary of China. China Ocean Press, Beijing.

Trewartha, G. T. 1978. Climatic regions, pp. 8–9. *In* Espenshade, E. B., Jr., and J. L. Morrison, eds., Goode's World Atlas, 15th edition. Rand McNally & Company, Chicago.

Trotter, M., B. H. Hixon, and B. J. MacDonald. 1977. Development and size of the teeth of *Macaca mulatta*. American Journal of Anatomy, *150:* 109–127.

Trouessart, E.-L. 1897. Catalogus Mammalium Tam Viventium Quam Fossilium. Nova Editio (Prima Completa). Fasciculus 1. Primates, Prosimiae, Chiroptera, Insectivora. R. Friedländer & Sohn, Berlin, v + 218 pp.

True, F. W. 1894. Notes on the mammals of Baltistan and the Vale of Kashmir, presented to the National Museum by Dr. W. L. Abbott. Proceedings of the United States National Museum, **17:** 1–16.

Turnquist, J. E., and M. J. Kessler. 1989. Free-ranging Cayo Santiago rhesus monkeys (*Macaca mulatta*): I. Body size, proportion, and allometry. American Journal of Primatology, **19:** 1–13.

———. 1990a. Dental eruption in free-ranging *Macaca mulatta* on Cayo Santiago. American Journal of Physical Anthropology, **81:** 309. (abstract only)

———. 1990b. Laboratory colonies versus a free-ranging population—dental eruption in rhesus macaques (*Macaca mulatta*). American Journal of Primatology, **20:** 239. (abstract only)

Uno, H., P. Alsum, M. L. Zimbric, W. D. Houser, J. A. Thomson, and J. W. Kemnitz. 1998. Colon cancer in aged captive rhesus monkeys (*Macaca mulatta*). American Journal of Primatology, **44:** 19–27.

U.S. Board on Geographic Names. 1952. India, Volumes I and II. Washington, D.C., 787 pp.

———. 1966a. Burma. Washington, D.C., 725 pp.

———. 1966b. Thailand. Washington, D.C., 675 pp.

———. 1971. Afghanistan. Washington, D.C., 170 pp.

———. 1973. Laos. Washington, D.C., 348 pp.

———. 1976. Bangladesh. Washington, D.C, 526 pp.

———. 1979. Gazetteer of the People's Republic of China. Washington, D.C., 919 pp.

———. 1983. Gazetteer of Pakistan, 3rd edition. Washington, D.C., 723 pp.

———. 1986. Gazetteer of Vietnam, Volumes I and II. Washington, D.C., 1143 pp.

Valerio, D. A., R. L. Miller, J. R. M. Innes, K. D. Courtney, A. J. Pallotta, and R. M. Guttmacher. 1969a. *Macaca mulatta*: Management of a Laboratory Breeding Colony. Academic Press, New York, xii + 140 pp.

VALERIO, D. A., A. J. PALLOTTA, AND K. D. COURTNEY. 1969b. Experiences in large scale breeding of simians for medical experimentation. Annals of the New York Academy of Sciences, **162:** 282–286.

VANČATA, V., H. ZLÁMALOVÁ, M. VANČATOVÁ, AND L. JEBAVÝ. 1995. Mode and rate of postnatal growth of *Macaca mulatta*—Basic adaptive trends and sexual dimorphism. Anthropologie, **33:** 29–38.

VANČATOVÁ, M. A., V. VANČATA, AND V. G. ČALJAN. 1986. Some aspects of reproduction and sexual behaviour in genus *Macaca*. Anthropologie, **24:** 261–265.

VANDENBERGH, J. G. 1967. The development of social structure in free-ranging rhesus monkeys. Behaviour, **29:** 179–194.

———. 1973. Environmental influences on breeding in rhesus monkeys, pp. 1–19. *In* Phoenix, C. H., ed., Primate Reproductive Behavior. S. Karger, Basel.

VANDENBERGH, J. G., AND S. VESSEY. 1968. Seasonal breeding of free-ranging rhesus monkeys and related ecological factors. Journal of Reproduction and Fertility, **15:** 71–79.

VAN HORN, R. N. 1980. Seasonal reproductive patterns in primates, pp. 181–221. *In* Reiter, R. J., and B. K. Follett, eds., Seasonal Reproduction in Higher Vertebrates. S. Karger, Basel.

VAN PEENEN, P. F. D., H. HOOGSTRAAL, J. F. DUNCAN, AND P. F. RYAN. 1968. Hematozoa from mammals of South Vietnam. Journal of Protozoology, **15:** 608–614.

VAN PEENEN, P. F. D., R. H. LIGHT, AND J. F. DUNCAN. 1971. Observations on mammals of Mt. Sontra, South Vietnam. Mammalia, **35:** 126–143.

VAN PEENEN, P. F. D., P. F. RYAN, AND R. H. LIGHT. 1969. Preliminary Identification Manual for Mammals of South Vietnam. United States National Museum, Smithsonian Institution, Washington, D.C., vi + 310 pp.

VAN WAGENEN, G. 1950. The monkey, pp. 1–42. *In* Farris, E. J., ed., The Care and Breeding of Laboratory Animals. John Wiley & Sons, New York.

———. 1972. Vital statistics from a breeding colony: Reproduction and pregnancy outcome in *Macaca mulatta*. Journal of Medical Primatology, **1:** 3–28.

VAN WAGENEN, G., AND H. R. CATCHPOLE. 1956. Physical growth of the rhesus monkey (*Macaca mulatta*). American Journal of Physical Anthropology, New Series, **14:** 245–273.

VAN WAGENEN, G., AND M. E. SIMPSON. 1973. Postnatal Development of the Ovary in *Homo sapiens* and *Macaca mulatta* and Induction of Ovulation in the Macaque. Yale University Press, New Haven, Connecticut, 306 pp.

VARLEY, M. A., AND S. H. VESSEY. 1977. Effects of geographic transfer on the timing of seasonal breeding of rhesus monkeys. Folia Primatologica, **28:** 52–59.

VESSEY, S. H. 1968. Interactions between free-ranging groups of rhesus monkeys. Folia Primatologica, **8:** 228–239.

———. 1973. Night observations of free-ranging rhesus monkeys. American Journal of Physical Anthropology, **38:** 613–619.

VESSEY, S. H., AND D. B. MEIKLE. 1987. Factors affecting social behavior and reproductive success of male rhesus monkeys. International Journal of Primatology, **8:** 281–292.

VESSEY, S. H., AND J. A. MORRISON. 1970. Molt in free-ranging rhesus monkeys, *Macaca mulatta*. Journal of Mammalogy, **51:** 89–93.

VICKERS, J. H. 1986. Approaches to determining colony infections and improving colony health, pp. 521–530. *In* Benirschke, K., ed., Primates: The Road to Self-Sustaining Populations. Springer-Verlag, New York.

WADA, K. 1984. Ecological adaptation in rhesus monkeys at the Kumaon Himalaya. Journal of the Bombay Natural History Society, **80:** 469–498. (For date of publication, see table of contents.)

WADA, K., XIONG CHENPEI, AND WANG QISHAN. 1986. On the distribution of Thibetan and rhesus monkeys in southern Anhui, China. Kyoto University Overseas Research Report of Studies on Asian Non-Human Primates, **5:** 79–94.

WAGNER, J. A. [1839]. *I. erythraeus* Schreb., pp. 142–143. *In* Schreber, J. C. D., A. Goldfuss, and J. A. Wagner, Die Säugthiere in Abbildungen nach der Natur mit Beschreibungen. Supplementband. Erste Abtheilung: Die Affen und Flederthiere. Expedition des Schreber'schen Säugthier- und des Esper'schen Schmetterlingswerkes, und in Commission der Palm'schen Verlagsbuchhandlung, Erlangen. (For date of publication, see Sherborn, C. D., 1892, Proceedings of the Zoological Society of London, **1891:** 591.)

WAGNER, J. A. [1851–55]. Die Säugthiere in Abbildungen nach der Natur mit Beschreibungen. Supplementband. Fünfte Abtheilung. Verlag von T. O. Weigel, Leipzig, xxvi + 810 pp. (For date of publication, see Horsfield, 1851, A catalogue of the Mammalia in the Museum of the Hon. East-India Company, J. & H. Cox, London, vi + 212 [work cited by Wagner] and Sherborn, C. D., 1892, Proceedings of the Zoological Society of London, **1891:** 592.)

WAHEEDA, K. 1992. Responsiveness toward novelty in urban and forest reared rhesus monkeys of different age groups, pp. 111–116. *In* Seth, P. K., and S. Seth, eds., Perspectives in Primate Biology: Volume 4. Primates—the New Revolution. Today & Tomorrow's Printers and Publishers, New Delhi.)

WALKER, M. L. 1995. Menopause in female rhesus monkeys. American Journal of Primatology, **35:** 59—71.

WALLEN, K. 1990. Desire and ability: Hormones and the regulation of female sexual behavior. Neuroscience and Biobehavioral Reviews, **14:** 233–241.

WANG JUN, FENG MIN, AND LI YANHONG. 1996. The study on population ecology of *Macaca mulatta* at Longhushan Nature Reserve, Guangxi. Acta Theriologica Sinica, **16:** 264–271. (in Chinese, English summary)

WANG SUNG, AND QUAN GUOQIANG. 1986. Primate status and conservation in China, pp. 213–220. *In* Benirschke, K., ed., Primates: The Road to Self-Sustaining Populations. Springer-Verlag, New York.

WANG YINGXIANG, AND JIANG XUELONG. 1995. Today and tomorrow of primatological studies in China, pp. 1–14. *In* Xia Wuping and Zhang Yongzu, eds., Primate Research and Conservation. China Forestry Pub-

lishing House, Beijing. (in Chinese, English summary)

Wang Zeng. 1987. Where monkeys are king. China Reconstructs, **36**(3): 38–39.

Watanabe, Y., T. Sakazume, K. Kurosaki, H. Oota, K. Washio-Watanabe, and S. Ueda. 1997. No directionality of short tandem repeat evolution at the HPRT locus in catarrhine primates. Folia Primatologica, **68:** 350–353.

Waterhouse, M. J., and H. B. Waterhouse. 1971. Population density and stress in zoo monkeys. The Ecologist, **1:** 19–21.

———. 1976. The development of social organization in rhesus monkeys (*Macaca mulatta*)—An example of bimodal attention structure, pp. 83–104. *In* Chance, M. R. A., and R. R. Larsen, eds., The Social Structure of Attention. John Wiley & Sons, London.

Weigold, H. 1916. Einige vorläufige Bemerkungen über die zoologischen Ergebnisse der Stötzner'schen Szetchwan-Expedition. Ornithologische Monatsberichte, **24:** 71–75.

———. 1922. Zoologische Ergebnisse der Walter Stötznerschen Expenditionen nach Szetschwan, Osttibet und Tschili auf Grund der Sammlungen und Beobachtungen Dr. Hugo Weigolds. 1. Teil, Aves: Vorwort. Abhandlungen und Berichte des Zoologischen und Anthropologisch-Ethnographischen Museums zu Dresden, **15:** iii–viii.

———. 1924. Zoologische Ergebnisse der Walter Stötzernschen Expeditionen nach Szetschwan, Osttibet und Tschili auf Grund der Sammlungen und Beobachtungen Dr. Hugo Weigolds. 3. Teil, Mammalia: Weitere Bemerkungen Dr. Weigolds zu den gesammelten Säugetieren. Abhandlungen und Berichte der Museen für Tierkunde und Völkerkunde zu Dresden, **16:** 71–76.

———. 1935. Südost-Tibet als Lebensraum. Jahrbuch der Geographischen Gesellschaft zu Hannover für 1934 und 1935, pp. 203–247.

Weinman, D. 1974. Trypanosomiasis in primates, human and subhuman, in India. Transactions of the Royal Society of Tropical Medicine and Hygiene, **68:** 345–346.

Weitzel, V., C. M. Yang, and C. P. Groves. 1988. A catalogue of primates in the Singapore Zoological Reference Collection, Department of Zoology, National University of Singapore (formerly Zoological collection of the Raffles Museum). Raffles Bulletin of Zoology, **36:** 1–166.

Wilen, R., and F. Naftolin. 1976. Age, weight and weight gain in the individual pubertal female rhesus monkey (*Macaca mulatta*). Biology of Reproduction, **15:** 356–360.

Wilson, A. P., and S. H. Vessey. 1968. Behavior of free-ranging castrated rhesus monkeys. Folia Primatologica, **9:** 1–14.

Wilson, M. E. 1981. Social dominance and female reproductive behaviour in rhesus monkeys (*Macaca mulatta*). Animal Behaviour, **29:** 472–482.

Wilson, M. E., and T. P. Gordon. 1980. Age differences in the duration of mating periods of female rhesus monkeys. Developmental Psychobiology, **13:** 637–642.

Wilson, M. E., T. P. Gordon, and D. Chikazawa. 1982. Female mating relationships in rhesus monkeys. American Journal of Primatology, **2:** 21–27.

Wilson, M. E., T. P. Gordon, C. G. Rudman, and J. M. Tanner. 1988. Effects of a natural *versus* artificial environment on the tempo of maturation in female rhesus monkeys. Endocrinology, **123:** 2653–2661.

Winkler, M. G., and P. K. Wang. 1993. The Late Quaternary vegetation and climate of China, pp. 221–258. *In* Wright, H. E., Jr., J. E. Kutzbach, T. Webb, III, W. F. Ruddiman, F. A. Street-Perrott, and P. J. Bartlein, eds., Global Climate since the Last Glacial Maximum. University of Minnesota Press, Minneapolis.

Wislocki, G. B. 1933a. Observations on the descent of the testes in the macaque and in the chimpanzee. Anatomical Record, **57:** 133–148.

———. 1933b. The reproductive systems, pp. 231–247. *In* Hartman, C. G., and W. L. Straus, Jr., eds., The Anatomy of the Rhesus Monkey (*Macaca mulatta*). Williams & Wilkins, Baltimore.

Wolfe, L. D. 1985. Molting in the freeranging rhesus macaques of Silver Springs, Florida. American Journal of Physical Anthropology, **66:** 243. (abstract only)

———. 1992. Feeding habits of the rhesus monkeys *Macaca mulatta*) of Jaipur and Galta, India. Human Evolution, **7:** 43–54.

Wolfe, L. D., and R. Mathur. 1988. Monkeys of Jaipur, Rajasthan, India: (*Macaca mulatta, Presbytis entellus*). Journal of the Bombay Natural History Society, **84:** 534–539. (For date of publication, see table of contents.)

Wroughton, R. C. 1914. Bombay Natural History Society's Mammal Survey of India, Burma, and Ceylon. Report No. 15. Journal of the Bombay Natural History Society, **23:** 282–301.

———. 1915a. Bombay Natural History Society's Mammal Survey of India, Burma, and Ceylon. Report No. 16. Journal of the Bombay Natural History Society, **23:** 460–480. (For date of publication, see title page of volume.)

———. 1915b. Bombay Natural History Society's Mammal Survey of India, Burma, and Ceylon. Report No. 19. Journal of the Bombay Natural History Society, **24:** 96–110. (for date of publication, see title page of volume.)

———. 1916a. Bombay Natural History Society's Mammal Survey of India, Burma, and Ceylon. Report No. 20. Journal of the Bombay Natural History Society, **24:** 291–316.

———. 1916b. Bombay Natural History Society's Mammal Survey of India, Burma, and Ceylon. Report No. 23. Sikkim and Bengal Terai. Journal of the Bombay Natural History Society, **24:** 468–493.

———. 1916c. Bombay Natural History Society's Mammal Survey of India, Burma, and Ceylon. Report No. 25. Journal of the Bombay Natural History Society, **24:** 758–773.

———. 1916d. Bombay Natural History Society's Mammal Survey of India, Burma, and Ceylon. Report No. 26. Darjiling District. Journal of the Bombay Natural History Society, **24:** 773–782.

———. 1917. Bombay Natural History Society's Mammal Survey of India, Burma, and Ceylon. Report No.

27. Bhutan Duars. Journal of the Bombay Natural History Society, **25:** 63–71.

———. 1918. Summary of the results from the Indian Mammal Survey of the Bombay Natural History Society. Journal of the Bombay Natural History Society, **25:** 547–598. (For date of publication, see title page of volume.)

———. 1921. Bombay Natural History Society's Mammal Survey of India, Burma, and Ceylon. Report No. 35. Prome. Journal of the Bombay Natural History Society, **27:** 553–554.

Wroughton, R. C., and K. V. Ryley. 1913. Bombay Natural History Society's Mammal Survey of India. Report No. 7. Journal of the Bombay Natural History Society, **22:** 45–58.

Wu Haohan. 1995. Variation in the population and distribution of stump-tailed macaques in Fujian's Wuyishan Nature Reserve, pp. 276–280. *In* Xia Wuping and Zhang Yongzu, eds., Primate Research and Conservation. China Forestry Publishing House, Beijing. (in Chinese, English abstract)

Wu Jiayan, and Li Guihui. 1982. A report on the mammals of Ankang Region, Sha[a]nxi Province. Zoological Research, **3:** 59–68. (in Chinese, English summary)

Wu Weitang. 1983. On the two rhinoceros subfossils from Hemudu Neolithic Site. Vertebrata PalAsiatica, **21:** 160–165. (in Chinese, English summary)

Xiao Zhi. 1979. Shennongjia forests: Home of rare species. China Reconstructs. **28**(8): 28–32.

Xu Longhui, and Liu Zhenhe. 1985. Mammalian fauna of Hainan Island, pp. 146–151. *In* Kawamichi, T., ed., Contemporary Mammalogy in China and Japan. Mammalogical Society of Japan (place of publication not specified).

Xu Longhui, Liu Zhenhe, and Yu Simian. 1983. Birds and Mammals of Hainan Island. Science Press, Beijing, xviii + 426 pp. (in Chinese)

Xu Qingi. 1988. Southward migration events of mammals in East Asia during the Pleistocene, and their relations with climatic changes, pp. 873–882. *In* Whyte, P., J. A. Aigner, N. G. Jablonski, G. Taylor, and Wang Pinxian, eds., The Palaeoenvironment of East Asia from the Mid-Tertiary, Volume 2. Centre of Asian Studies, University of Hong Kong, Hong Kong.

Xue Deming, Xin Bingqian, Qu Wenyuan, and Zhang Wenxue. 1988a. Studies on humerus and clavicula of adult Taihang Mountains *Macaca mulatta* (*M. m. tcheliensis*). Zoological Research, **19:** 143–147. (in Chinese, English abstract)

Xue Deming, Zhang Wenxue, Xin Bingqian, Guo Mei, and Qu Wenyuan. 1998b. Study on the shoulder joint of adult Taihang Mountains macaque (*Macaca mulatta tcheliensis*). Chinese Primate Research and Conservation News, 7: 11, 29. (abstract only, in Chinese and English)

———. 1999. Study on the shoulder joint of adult Taihang Mountains *Macaca mulatta* (*M. mulatta tcheliensis*). Acta Anthropologica Sinica, **18:** 133–141. (in Chinese, English abstract)

Xue Xiangxi, and Zhang Yunxiang. 1991. The Quaternary mammalian fossils and the fossil human beings in China, pp. 307–374. *In* Zhang Zonghu, ed., The Quaternary of China. China Ocean Press, Beijing.

Yang, C. M., and L. M. Chou. 1984. The mammal collection of the Zoological Reference Collection, National University of Singapore. Acta Zoologica Fennica, **170:** 55–56.

Yao Jianchu, Shao Mengming, Pan Ruliang, and Peng Yanzhang. 1995. Studies on the variation of teeth in rhesus monkeys. Acta Theriologica Sinica, **15:** 113–117. (in Chinese, English summary)

Yen Wenchen. 1973. Helminthes of birds and wild animals from Lin-Tsan Prefecture, Yunnan Province, China. II. Parasitic nematodes of mammals. Acta Zoologica Sinica, **19:** 354–364. (in Chinese, English summary)

Yerkes, R. M. 1915. Notes on maternal instinct in a monkey. Journal of Animal Behavior, **5:** 403–405.

You Yuzhu, and Cai Baoquan. 1996. Stratigraphic division, fossil mammals and environment of the Pleistocene in Fujian Province. Acta Anthropologica Sinica, **15:** 335–346. (in Chinese, English summary)

Yu Fahong, Peng Yanzhang, and Pan Ruliang. 1996. The multivariate analysis on the rhesus skulls from Hunan, Hubei, Fujian and Guangdong. Acta Anthropologica Sinica, **15:** 151–158. (in Chinese, English abstract)

Yu Fahong, Peng Yanzhang, Pan Ruliang, Ye Zhizhang, and Wang Hong. 1993. The scapular comparison of rhesus monkeys in Sichuan, Yunnan, Hubei and Hunan in China. Acta Theriologica Sinica, **13:** 81–87. (in Chinese, English abstract)

Zeng Qingsong. 1982. Tropical forest paradise. China Reconstructs, **31**(4): 68–69.

Zeng Zhongxing. 1992. Growth and development of the rhesus monkey in China, pp. 18–23. *In* Chen Qiansheng, Ouyang Zizhuo, Ma Zhaolin, Zeng Huizhong, Ji Weizhi, Tian Baoping, Song Huaiyan, Yan Mingjie, Peng Chuangui, Zeng Zhongxing, Li Jingjing, and Li Xiaohang, eds., The Research and Exploitation of Primate Laboratory Animals in China. Chinese Science and Technology Publishers, Beijing. (Chinese and English texts)

Zeng Zhongxing, Bai Shouchang, and Chen Yuanlian. 1984. Relations in the tooth sequence, age and ontogeny of rhesus monkeys (*Macaca mulatta*). Acta Theriologica Sinica, **4:** 81-87. (in Chinese, English abstract)

Zeng Zhongxing, Chen Yuanlian, and Bai Shouchang. 1983. Observations on breeding of rhesus monkeys (*Macaca mulatta*) in captivity. Acta Theriologica Sinica, **3:** 147-155. (in Chinese, English summary)

Zhang Minghua. 1985. Preliminary study of the Holocene (Neolithic Site) mammalian fauna of South China, pp. 163–167. In Kawamichi, T., ed., Contemporary Mammalogy in China and Japan. Mammalogical Society of Japan (place of publication not specified).

Zhang Yaping, and Shi Liming. 1989. Mitochondrial DNA polymorphism in five species of the genus *Macaca*. Chinese Journal of Genetics, **16:** 325–338.

———. 1993a. Phylogenetic relationships of macaques as inferred from restriction endonuclease analysis of mitochondrial DNA. Folia Primatologica, **60:** 7–17.

———. 1993b. Phylogeny of rhesus monkeys (*Macaca mulatta*) as revealed by mitochondrial DNA restriction enzyme analysis. International Journal of Primatology, **14:** 587–605.

Zhang Yongzu, Jin Sangke, Quan Guoqiang, Li Shihau, Ye Zhongyao, Wang Fenggui, and Zhang Manli. 1997. Distribution of Mammalian Species in China. China Forestry Publishing House, Beijing, x + 280 pp. (Chinese and English texts)

Zhang Yongzu, and Quan Guoqiang. 1996. Action Plan for Chinese Primate Conservation 1996–2000. Chinese Primate Specialist Group of Chinese Mammalogical Society, Beijing, 48 pp.

Zhang Yongzu, Quan Guoqiang, Lin Yonglei, and C. H. Southwick. 1989. Extinction of rhesus monkeys (*Macaca mulatta*) in Xinglung, North China. International Journal of Primatology, **10:** 375–381.

Zhang Yongzu, Quan Guoqiang, Zhao Tigong, and C. H. Southwick. 1991. Distribution of macaques (*Macaca*) in China. Acta Theriologica Sinica, **11:** 171–185.

Zhao Xiaojin, Zhai Xinhui, Wan Xia, and Xue Deming. 1999. The correlation among various measurements of *Macaca mulatta* mandible from Taihang Mountains. Acta Anthropologica Sinica, **18:** 60–65. (in Chinese, English abstract)

Zheng Xueqing. 1984. A preliminary survey of the resources of monkeys in Fujian, with suggestions on its conservation. Wuyi Science Journal, **4:** 145–148. (in Chinese, English abstract)

Zheng, Z., and Z.-Q. Lei. 1999. A 400,000 year record of vegetational and climatic changes from a volcanic basin, Leizhou Peninsula, southern China. Palaeogeography, Palaeoclimatology, Palaeoecology, **145:** 339–362.

Zhonghua Renmin Gongheguo Fen Sheng Dituji (Hanyu Pinyinban), third edition. 1983. Ditu Chubanshe, Beijing, 174 pp.

Zhu Jun, Zhao Yishan, and Fan Longsuo. 1995. The present situation and protection of rhesus monkeys in Shanxi Province, pp. 133–137. *In* Xia Wuping and Zhang Yongzu, eds., Primate Research and Conservation. China Forestry Publishing House, Beijing. (in Chinese, English abstract)

Zimmermann, E. A. W. 1780. Geographische Geschichte des Menschen und der Vierfüssigen Thiere, Volume 2. Weygandschen Buchhandlung, Leipzig, 432 pp.

Zimmermann, R. R., D. A. Strobel, P. Steere, and C. R. Geist. 1975. Behavior and malnutrition in the rhesus monkey. Primate Behavior: Developments in Field and Laboratory Research, **4:** 241–306.

Zlámalová, H., V. Vančata, L. Jebavý, and M. Vančatová. 1994. Somatometry of rhesus macaques—Somatic development up to 24 months. Anthropologie, **32:** 197–200.

———. 1995. Ontogeny and growth of higher primates—A somatometric approach. Anthropologie, **33:** 39–46.

Zuckerman, S. 1930. The menstrual cycle of the primates—Part I. General nature and homology. Proceedings of the Zoological Society of London, **1930:** 691–754.

———. 1937. The duration and phases of the menstrual cycle in primates. Proceedings of the Zoological Society of London, **107:** 315–329.

Zuckerman, S., G. van Wagenen, and R. H. Gardiner. 1938. The sexual skin of the rhesus monkey. Proceedings of the Zoological Society of London, **108:** 385–401.

Note Added in Proof

Listed below are relevant supplementary publications that appeared while this monograph was in press.

Choudhury, A. 2000. Primates in Gibbon Sanctuary Assam, India. Asian Primates, **7**(1–2): 4–6. (For date of publication, see p. 32.)

Colman, R. J., J. J. Ramsey, E. B. Roecker, T. Havighurst, J. C. Hudson, and J. W. Kemnitz. 1999. Body fat distribution with long-term dietary restriction in adult male rhesus macaques. Journal of Gerontology: Biological Sciences, **54A:** B283–290.

Duckworth, J. W., R. J. Timmins, K. Khounboline, R. E. Salter, and P. Davidson. 1999. Large Mammals, pp. 161–220. *In* Duckworth, J. W., R. E. Salter, and K. Khounboline (compilers), Wildlife in Lao PDR: 1999 Status Report. IUCN—The World Conservation Union, Wildlife Conservation Society, and Centre for Protected Areas and Watershed Management, Vientiane.

International Code of Zoological Nomenclature, 4th ed. 1999. International Trust for Zoological Nomenclature, London, xxix + 306 pp.

Johnson, E. 1999. Food-neophobia in semi-free ranging rhesus macaques: Effects of food limitation and food source. American Journal of Primatology, **50:** 25–35. (For date of publication, see outside back cover.)

Price, K. C., J. S. Hyde, and C. L. Coe. 1999. Matrilineal transmission of birth weight in the rhesus monkey (*Macaca mulatta*) across several generations. Obstetrics and Gynecology, **94:** 128–134.

Smith, D. G., S. Kanthaswamy, J. Viray, and L. Cody. 1999. Additional highly polymorhic microsatellite (STR) loci for estimating kinship in rhesus macaques (*Macaca mulatta*). American Journal of Primatology, **50:** 1–7. (For date of publication, see outside back cover.)

Westergaard, G. C., M. K. Izard, and J. H. Drake. 1999. Reproductive performance of rhesus macaques (*Macaca mulatta*) in two outdoor housing conditions. American Journal of Primatology, **50:** 87–93. (For date of publication, see outside back cover.)

Wong, C. L., and I.-H. Ni. 1999. Population dynamics of the feral macaques in the Kowloon Hills of Hong Kong. American Journal of Primatology, **50:** 53–66. (For date of publication, see outside back cover.)

Appendix 1: Specimens Examined (Total 638)

Skins and Skulls, 342

AFGHANISTAN, 1. *Konarha* (1), Chigha Sarai, north of—FMNH 102839.

BANGLADESH, 6. *Satkhira* (6): Sundarbans, ca. 50 mi east of Calcutta—ZSI 11905–11907, 11925, 11931, 11985.

CHINA, 137. *Anhui* (1): Tong Kou—IZCAS 17588. *Fujian* (7): Chong'an Xian—AMNH 84474, 84476; Fuqing vicinity—IZCAS 23020, 23021; Kuatun BM(NH) 1898.11.1.29, 1900.5.8.1, MNHN 1874/481. *Guangdong* (41): Bawangling—SCIEA Coll. No. 0409; Changtian—SCIEA Coll. Nos. 0470–0473; Dangan Dao—BM(NH) 1868.12.29.10, SCIEA Coll. Nos. 2150, 2151; Dongfang—IZCAS 12742; Henron—AMNH 26646; Jianfengling—SCIEA Coll. No. 0089; Mihouling—SCIEA Coll. No. 0736; Miwan—SCIEA Coll. No. 2153; Nada—AMNH 59987–59989, 60067, 39375; Nanfeng Shi—AMNH 60038, MCZ 26475; Nanwan, Xingcungang—SCIEA Coll. Nos. 0755, 0776; Neilingding Dao—SCIEA Coll. No. 2155; Nychow vicinity—BM(NH) 1870.7.18.19; Pisui—ZMB A194.09; Wuzhi Shan—AMNH 27568–27575, 27577, 27578, BM(NH) 1909.7.11.1; Xi Shia—IZCAS 17962; Xinlong—SCIEA Coll. No. 036; Yiajia—SCIEA Coll. No. 718; Zhayun—SCIEA Coll. No. 0251; locality unknown—MCZ 19991. *Guangdong* or *Guangxi* (1): locality unknown—MCZ 20017. *Guangxi* (11): Lungli vicinity—private collection, Lungli; Nanning—KIZ Coll. No. 631425; Pochuan, 6–7 km west of—IZCAS unnumbered; Xi Jiang, near Wuzhou—ZMB A73.12; locality unknown—SMNH 1126, 1127, 2106, 2108, USNM 240008, 240010, 240011. *Guizhou* (6): Getou—KIZ 03178, 03179, 03181; Meitan, near—IZCAS 17959; locality unknown—KIZ 000179, Coll. No. 610051. *Hebei* (13): Xinglong Xian, southern (= Eastern Tombs)—AMNH 57038–57040, 57042, 57043, 57108, 57110, FMNH 39376–39378, MNHN 335 (281A, 1867-557), USNM 240704, 240705. *Hunan* (3): locality unknown—SCIEA Coll. Nos. 013–015. *Qinghai* (2): Baima—IZCAS 19186; Jegu Xiang—NWPIB 00033. *Sichuan* (18): Gin Keo Ho, cliff above—USNM 241160; Kangding—MNHN 1891/388; Leshan, mountains 30 mi southwest of—BM(NH) 1911.9.8.1; Olongche—MNHN 1891/387; Tongjiang Xian—SIZ 00001–00004; Tseo-Jia-Geo—USNM 256669; Wa Shan, near Dong He—RMNH 4585/W50, 4585/V67; Xi Golog (= Singolo)—ANSP 15126 (skin)/MCZ 30384 (skull); Yajiang—MCZ 7922; Yibin (= Suifu)—USNM 239133; Yunnan border, south of Yibin—USNM 258183, 258184; locality unknown—BM(NH) 1871.4.21.4; ZMB 28919. *Xizang* (3): Yigong—NWPIB Coll. No. 73066; Zayü Xian—IZCAS Coll. No. 20 (external measurements questionable, provided by local hunter [Quan Guogiang, IZCAS, letter, 30 October 1995]), 21. *Yunnan* (25): Ashi—USNM 240175, 240176; Cala Shan—IZCAS 17960, 17963; Datang—KIZ Coll. Nos. 76318, 76320, 76321, 76324, 76325, 76344; Gengma—IZCAS 25227,25233, 25260; Hotha Valley—ZSI 11986; Hui-Yao—AMNH 43084, 43086, MCZ 26478; Manpa—IZCAS 19554, 20218; Meng-ban—IZCAS 15054; Mengla Xian—KIZ 000150; Mengyang—IZCAS 10303, 10304,15053; Santaishan—KIZ 000171. *Zhejiang* (1): Huangqiao—HUBD unnumbered. Province unknown (5): *CHINA*—BMNH 79; ZSBS 17/1943; *CHINA*, northern—ZMB 5811; *CHINA*, South—MCZ 19988, 19990.

INDIA, 60. *Arunachal Pradesh* (2): Dening—BM(NH) 1931.1.11.13, 1931.1.11.14. *Assam* (7): Bogra Nadi—BM(NH) 1931.1.11.6; Golaghat—BM(NH) 1931.1.11.12; Hot Springs—BNHS 5087; Kulsi [River]—BNHS 5088; Lamsakhang—BM(NH) 1921.7.9.4; Rajapara—BM(NH) 1921.7.9.3; locality unknown—ZSI 11928. *Bihar* (3): Luia—BM(NH) 1915.4.3.1, 1915.4.3.2, BNHS 5089. *Gujarat* (3): Dangs District—BM(NH) 1931.1.11.1–1931.1.11.3. *Himachal Pradesh* (6): Dharmsala—BM(NH) 1933.12.1.2; Kangra—BNHS 5112, 5114; Kangra Fort—BM(NH) 1923.9.1.118; Samayala—BN (NH) 1931.1.11.34, 1931.1.11.35. *Jammu & Kashmir* (11): Dunwein—P-CM T4/2(skin), T4/8 (skull); Kashmir—BM(NH) 1871.3.3.5, USNM 63471; Kotihar—USNM 173812, 173813; Lolab—USNM 20120–20124; Lolab Valley—USNM 173814. *Manipur* (3): Bishenpur—BM(NH) 1943.60, 1943.61; Imphal, ca. 4 mi north of—ZSI 11187. *Meghalaya* (1): Nangpoh—BM(NH) 1931.1.11.15. *Nagaland* (2): Changchang Pani—AMNH 83431, 83432. *Tripura* (2): Ampi Bazar, ca. 3 km southeast of resthouse—ZSI Coll. No. TM4; Charilam resthouse—ZSI Coll. No. TM18. *Uttar Pradesh* (10): Bageshwar—BM(NH) 1914.7.10.1–1914.7.10.3; Jhirna—ZSI 12091; Ramnagar—BNHS 5108; Ratighat—BM(NH) 1914.7.10.4, 1914.7.10.5, BNHS 5109; Sita Bani—BM(NH) 1931.1.11.31, BM(NH) 1931.1.11.32. *West Bengal* (8): Bharnabhari—BM(NH) 1931.1.11.8; Hasimara—BM(NH) 1916.7.29.1, 1916.7.29.2, 1931.1.11.9; Mangpu—FMNH 35448, 35449; Narbong—BM(NH) 1915.9.1.1; Sukna—ZSI 7294. State unknown (2): *INDIA*—BM(NH) 1841.12.25.1, BM(NH) 1842.4.29.55.

INDIA or BANGLADESH, 2. Bengalen—NHMB 29, 31.

LAOS, 8. *Louangphrabang* or *Phongsali* (1):

Ou, Nam (= Nam U), between Muang Khoua and Muang Ngoy—FMNH 31763. *Saravan* (5): Muang Thateng—ANSP 15134–15137, 15138 (external measurements in AMNH catalog, no. 87277). *Vientiane* (2): Ban Mak Nao, Camp No. 34—ZRC 4-152; Mekong River, 90 km above Viangchan—USNM 240488.

MYANMAR, 72. *Chin* (2): Ali Cha—BM(NH) 1931.1.11.22; Kindat, 20 mi northwest of—BM(NH) 1931.1.11.26. *Irrawaddy* (1): Pye (= Prome), 30 mi southeast of—BMHS 5081. *Kachin* (19): Bawmwang—BM(NH) 1950.373; Bhamo—BM(NH) 1936.12.26.4; Htingnan Triangle;—BM(NH) 1950.372; Karen Chaung—BM(NH) 1937.12.3.75; N'Changyang—BM(NH) 1950.374; Nanyaseik—AMNH 112722–112725; Singkaling Hkamti—BM(NH) 1931.1.11.25; Singkaling Hkamti, 500 ft—BNHS 5093; Singkaling Hkamti, left (east) bank—ZSI 12088; Singkaling Hkamti, right (west) bank—AMNH 112988; Taga Hka—AMNH 112734, 112971; Tang Hpre—USNM 279191; Tanga-Shingaw—AMNH 114547; Taro—AMNH 112732, 112733. *Karen* (3): Toungoo, 13 mi east of—BM(NH) 1931.1.11.20, BNHS 5105; Toungoo, 15 mi north of—BM(NH) 1927.11.18.1. *Mandalay* (14): Kokkoaing—BM(NH) 1937.12.3.76; Lethan Hka—BM(NH) 1936.12.26.3; Maymyo—AMNH 163616; Popa Hill, 1000 m—AMNH 163610–163615; Popa Hill, 4961 ft—BM(NH) 1914.7.19.2, BNHS 5102–5104, 5106. *Pegu* (6): Pye (= Prome), 35 mi southeast of—BM(NH) 1931.1.11.21; Toungoo, 30 mi northwest of—BM(NH) 1931.1.11.17, BNHS 5101; Toungoo, east side of Sittang River—BM(NH) 1931.1.11.16, 1931.1.11.18, 1931.1.11.19. *Sagaing* (20): Heinsun—AMNH 112739, 112972; Hisweht—BM(NH) 1931.1.11.24; Homalin—BM(NH) 1915.5.5.3, 1915.5.5.4, BNHS 5094 Kin—BNHS 5095; Maungkan—AMNH 112741; Mingun—BM(NH) 1914.7.19.1; Moklok—AMNH 112740; Tatkon, east bank of Chindwin River—BNHS 5091; Tatkon, west bank of Chindwin River—BM(NH) 1915.5.5.6, BNHS 5090; Yin, east bank of lower Chindwin River—BM(NH) 1915.5.5.7; BNHS 5097; FMNH 82806, 82807; Yin, lower Chindwin River—BNHS 5096, 5098, 5099. *Shan* (7): Mansam Falls—BM(NH) 1931.1.11.28, BNHS 5082, 5083, 5085; Pyaunggaung—BM(NH) 1931.1.11.30, BNHS 5084; Seeng—BM(NH) 1931.1.11.29.

NEPAL, 10. *Bagmati* (4): Bouzini—BM(NH) 1931.1.11.10; Gokarna—FMNH 104164; Nagarkot BM(NH) 1921.5.1.1, 1921.5.1.2. *Gandaki* (1): Chengli—BM(NH) 1931.1.11.11. *Narayani* (1): Hazaria patherghatta—BM(NH) 1922.5.16.2. Zone unknown (4): *NEPAL*—BM(NH) 1845.1.8.222–1845.1.8.224, 1972.1015.

PAKISTAN, 9. *North-west Frontier* (4): Dunga Gali—USNM 353186; Ghora Dhaka, 1 mi east of—USNM 326332; Kaotai—BM(NH) 1920.6.11.1; Paia—USNM 353187. *Punjab* (2): Patriata—BM(NH) 1923.11.4.1, BNHS 5113. Province unknown (3): "Karrachi"—IRSN 6857–6859.

THAILAND, 14. *Chiang Mai* (3): Chiang Dao—MCZ 37706; Chiang Mai, near—ZRC 4-154; Kaeng mae Hat (= Me Ping rapids)—ZRC 4-188. *Kamphaeng Phet* (1): Ban Umphang, 28 mi southeast of—AMNH 54816. *Loei* (3): Dan Sai District—USNM 300017, 307715 307716. *Nan* (1): Pang Nam Un—USNM 296917. *Nong Khai* (2): Nong Khai, Camp No. 28—ZRC 4-150, 4-151. *Tak* (4): Ban Mae Lamao—FMNH 99668: Huai Ap Nang—FMNH 99669; Huai Kwang Pah—CTNRC (formerly FMNH 99670); Tha Chang Tai—ZRC 4-153.

VIETNAM, 23. *Bac Thai* (3): Bac Can—BM(NH) 1927.12.1.18, 1927.12.1.20, MNHN 1929/456. *Hai Phong* (2): Ang Co—ZMVNU 01/3.61.40/Pc 40; Cat Ba, Dao—ZMVNU 05/3.163.0. *Hoa Binh* (1): Hoa Binh—IEBR 70/1238/11. *Kon Tum* (3): Dak Sut—USNM 320780–320782. *Lai Chau* (5): Bac Tan Trai—ANSP15133; Muong Boum—FMNH 31766; Muong Moun—FMNH 31764; Muong Muon–AMNH 87278; Muong Pon—AMNH 87264. *Nghe An* (3): Nghia Dan—BM(NH) 1928.7.1.11; Nighia Dung—IEBR 520/145/695, 733(833)/560/175. *Quang Nam-Da Nang* (2): Son Tra, Mt., 3.9 km west and 0.3 km south of—USNM 356968; Song-Ta-Voy—MNHN 1899/54. *Tuyen Quang* (3): Chiem Hoa—ZMVNU 167/3.18.14; Thanh Tuong–IEBR 48, 62 (external measurements of both in Dao, 1985, p. 36). Province unknown (1): *VIETNAM*—IEBR 2241.

SKINS ONLY, 154

AFGHANISTAN, 1. *Konarha* (1): Nurestan (= Kafirstan), eastern—BM(NH) 1931.1.9.1.

BANGLADESH, 1. *Satkhira* (1): Sundarbans, ca. 50 mi east of Calcutta—ZSI 11984.

CHINA, 84. *Anhui* (9): Tong Kou—IZCAS 18068; Tunxi—SMNH 23; locality unknown—SMNH 14, 25, 26, 32, 33, 35, 463. *Fujian* (4): Kuatun—MNHN 1874/480; Pucheng Xian—SCIEA Coll. No. Min 008; Sha Xian—SCIEA Coll. No. Min 011; locality unknown—SCIEA Coll. no. Min 009. *Guangdong* (2): Dongfang—FUBD 156; Hainan Dao—ZMB 43500. *Guangxi* (24): Batu—FDCG A 005; Dongmen—IZCAS unumbered; Longman—FDCG unnumbered (skull inside); Xunle vicinity—

private collection, Xunle, three unnumbered skins; Zhongzhou—FDCG C 0014 (skull inside); locality unknown—SMNH 15, 19, 20, 24, 28, 29, 367, 368, 484, 856, 915, 916, 1002, 1168, 1425, 2107, USNM 240012. *Guizhou* (5): Zunyi vicinity—BMNH 5.66.150—5.66.153, IZCAS 20770. *Hebei* (1): Xinglong Xian (= Yungling), southern—BM(NH) 1931.1.7.2. *Qinghai* (1): Jegu Xiang—NWPIB Coll. No. 63167. *Sichuan* (2): Batang vicinity—IZCAS 20219; Dêgê vicinity—IZCAS 25940. *Sichuan* or *Xizang* (2): Tibet—MNHN 1892/315, 1894/1432. *Xizang* (1): Zayü Xian—IZCAS 73248. *Yunnan* (12): Biloxue Shan—KIZ Coll. no. 780417; Menghai—IZCAS 15052; Mengla Xian—KIZ 03174, 03180; Menglun—KIZ Coll. No. 75840, unnumbered; Shanman—KIZ 000153; Tengchong (= Momien)—IZCAS 17586, ZSI 619; Xishuangbanna—KIZ 03172, 03173; Yongde vicinity—IZCAS 21513. *Zhejiang* (1): Xindeng—ZMNH Coll. No. 633 (skull inside). Province unknown (20): *CHINA*—BM(NH) 1931.1.7.1, IZCAS 17954, 18121, 18123, 24914, SCIEA Coll. No. 0003, SMNH 16, 17, 21, 22, 27 (on exhibit), 30, 31, 38, 39, 458, 479, 914, 1162; *?CHINA*—MNHN unnumbered.

INDIA, 22. *Andhra Pradesh* (1): Siddeldar Hill—ZSI unnumbered. *Arunachal Pradesh* (2): Dening—BNHS 5086; Margherita—ZSI 12090. *Assam* (1): Rajapara—BM(NH) 1931.1.11.7. *Jammu & Kashmir* (1): Dunwein—P-CM T4/1 (on exhibit, skull inside). *Madhya Pradesh* (3): Kakara—BM(NH) 1931.1.11.5; Malua—BNHS 5107; Sohagpur—BM(NH) 1931.1.11.4. *Nagaland* (1): Samaguting—ZSI 11987. *Orissa* (3): Deogarh—ZSI Coll. No. OM/D/30; Gudari—BM(NH) 1928.3.7.4; Malkangiri—BM(NH) 1928.3.7.3. *Sikkim* (2): locality unknown—BM(NH) 1891.10.7.4, 1891.10.7.5 (skull inside). *Uttar Pradesh* (3): Dela—BM(NH) 1931.1.11.33; Haripur—BNHS 5111; Ramnagar—BM(NH) 1951.609. *West Bengal* (2): Hasimara—BNHS unnumbered (on exhibit); Sivok—FMNH 35447. State unknown (3): *INDIA*—BM(NH) 1842.12.19.14, 1926.2.9.1; *?INDIA*—BM(NH) 1851.8.29.4 (skull inside).

INDIA or BANGLADESH, 1. "(Bengal)"—ANSP 3950.

MYANMAR, 11. *Kachin* (3): Hkandau—BM(NH) 1950.376; Karen Chaung—BN (NH) 1937.12.3.77; N'Changyang—BM(NH) 1950.375. *Mandalay* (1): Madaya—BM(NH) 1936.12.26.5. *Pegu* (2): Toungoo, 20 mi west of—BNHS 5100; Toungoo, 30 mi northwest of—ZSI 12089. *Sagaing* (3): Tatkon, near Kindat, west bank of Chindwin River—BM(NH) 1931.1.11.23, BNHS 5092; Yin, east bank of lower Chindwin River—ZSI 12094. *Shan* (2): Mansam Falls—BM(NH) 1931.1.11.27, 1972.836 (in alcohol).

NEPAL, 4. *Bagmati* (4); Gokarna—UPS Coll. No. 529 (formerly FMNH 104163); Trisuli Bazar, 4 mi southeast of—FMNH 135427–135429 (all three in alcohol).

THAILAND, 1. *Tak* (1): Huai Kwang Pah—FMNH 99671 (in alcohol).

VIETNAM, 29. *Bac Thai* (4): Bac Can—BM(NH) 1927.12.1.19; Ban Thi—ZMVNU 07; Linh Thong—ZMVNU 08/3.20.72, 26/3.19.71. *Cao Bang* (3): Ly Bon—IEBR 32, 33, 34 (external measurements in Dao, 1985, p. 46). *Ha Tinh* (1): Ky Son—IEBR 40/441. *Hai Phong* (3): Cat Ba, Dao—ZMVNU 02/3.66.11, 03/3.62.9, 04/3.64.0. *Hoa Binh* (2): Phu Vach—IEBR 1275/M44; locality unknown—ZMVNU 28/3.81.Pc7 (mismatched with *M. arctoides* skull). *Lai Chau* (1): locality unknown—IEBR D. 3/M37. *Quang Binh* (1): Xuan Ninh—IEBR 560. *Quang Ninh* (2): Van Hai, Dao—ZMVNU 06/3.16.4, 537/3.17.5. *Yen Bai* (1): locality unknown—IEBR D1 (possibly belongs with IEBR 835/36/199, skull only, Thuong Bang La). Province unknown (11): Tonkin—MNHN 1887/11; *VIETNAM*—IEBR unnumbered (6), ZMVNU 09/3.15.3, 10/3.22, 731, 732.

SKULLS ONLY, 142

CHINA, 52. *Anhui* (1): Locality unknown—SMNH 1514. *Fujian* (1): Kuatun—BM(NH) 1897.6.5.2. *Guangdong* (3): Dongfang—FUBD 156; Xi Shia—IZCAS 17961, 17964. *Guangxi* (19): Bamo village, near—IZCAS unnumbered; Bapon—FDCG P 037; Batu—FDCG A 004; Ditin—FDCG A 008; Hechi Prefecture—IZCAS unnumbered (3); Jenli, 2–3 km north of—private collection, Jenli; Liuzhai vicinity–private collection, Liuzhai; Piangzu, 3.5 km northeast of Banli—private collection, Banli; Tian'e Xian—IZCAS unnumbered (3); Xianan, Huanjiang Xian—private collection, Huanjiang; Xianan-Mulun—private collection, Mulun; Yuhun—FDCG unnumbered (2); locality unknown—SMNH 1186, 1515. *Guizhou* (1): Fameng—KIZ Coll. No. 631094. *Hebei* (1): Xinglong Xian, southern—USNM 240703. *Sichuan* (2): Olongche—MNHN 1891/389; Yunnan border—USNM 253780. *Xizang* (3) Zayü Xian—NWPIB Coll. Nos. 73230, 73232, 73233. *Yunnan* (9): Jinping—IZCAS 04990; Manpa—KIZ Coll. Nos. 80853, 80854; Menghai—IZCAS 10305; Mengla Xian—KIZ Col. No. 00; Nonglin—KIZ Coll. No. 592005; Tengchong Xian–KIZ Coll. No. 76323; locality unknown—IZCAS

17947, 25953. *Zhejiang* (1): Zhoucun—ZMNH Coll. No. 85002 (skin unavailable in October 1985). Province unknown (11): *China*—BMNH 49, SMNH 1516–1519, 1775 2091, 2096, 2099–2101.

INDIA, 16. *Assam* (2): Cachar District—BNHS 6246; locality unknown—BM(NH) 1858.5.4.247. *Himachal Pradesh* (1): Simla vicinity—BNHS 5110. *Jammu & Kashmir* (1): Kashmir—BM(NH) 1856.5.6.12 (identification questionable). *Uttar Pradesh* (6): Bageshwar—BM(NH) 1914.7.10.6, 1914.7.10.7, Bijnor—BM(NH) 1926.10.8.8; Ramnagar—BM(NH) 1914.7.10.8, 1914.7.10.9; Saktesgarh—BM(NH) 1848.2.1.26. *West Bengal* (3): Calcutta, Indian Museum Compound—ZSI 15293; locality unknown—BM(NH) 1856.5.6.18, BNHS Coll. No. 5321. State unknown (3): *INDIA*—BM(NH) 1843.5.27.2, ZSI unnumbered (two, including female skull mismatched with male skin collected at Siddeldar Hill).

INDIA or BANGLADESH, 1. Bengalen—-MZB 6732.

LAOS, 1. *Louanqphrabanq* (1): Ou, Nam (= Nam hou)—MNHN 1892/1357.

MYANMAR, 9. *Chin* (1): Chittagong Hill Tracts—BM(NH) 1926.10.8.7. *Kachin* (3): *MYANMAR*, upper—BM(NH) 1950.377; Singkaling Hkamti—BM(NH) 1915.5.5.5, 1972.1333. *Mandalay* (1): Popa Hill—BNHS 6249. *Sagaing* (2): Chindwin River—BNHS 6247; Kindat—BM(NH) 1910.10.19.5. *Shan* (1): Pyaunggaung—BNHS 6248 (locality and date inferred from collector's number). *Tenasserim* (1): locality information probably inaccurate—ZMB A161.12(2).

NEPAL, 5. *Bagmati* (3): Trisuli Bazar, 4 mi southeast of—FMNH 104165-1041167. Zone unknown (2): *NEPAL*—BM(NH) 1845.1.8.5, 1858.6.24.144.

VIETNAM, 58. *Bac Thai* (4): Ban Thi—ZMVNU 185/3.162.0 (identification tentative), Cho Don District—FCXM 011; Thai Nguyen ZMVNU—172/3.151.Pc23, 196/Pc22. *Cao Bang* (4): Ban Vay—ZMVNU 186/3.169.0; Ly Bon—IEBR T33; Po Lu—ZMVNU 184/3.165.61; Trung Khanh District—FCXM 43 (with mismatched mandible). *Ha Trinh* (2): Huong Son—FCXM 05; Trai Tru—IEBR 63/622 (external measurements in Dao, 1985, p. 244). *Hai Phong* (4): Ang Co–ZMVNU 174/3.161.Pc52/38; Cat Ba, Dao—ZMVNU 175/3.158.Pc49, 176/3.159.Pc50, 177/3.160.Pc51. *Lang Son* (1): locality unknown—ZMVNU 180/Pc25. *Nghe An* (4): Ban Bu—FCXM 015 (external measurements in card catalog); locality unknown—ZMVNU 168/3.153.Pc31, 169/3.155.Pc33, 170/3.154.Pc32. *Ninh Binh* (2): Cuc Phuong—ZMVNU 64/3.148.Pc35, 173/3.149.Pc19 (both identifications tentative). *Quang Binh* (1): Bo Trach District—IEBR 1431. *Quang Nam-Da Nang* (2); Son Tra, Mt—USNM 356978 (mandible missing), 356979 (external measurements in collector's fieldbook). *Quang Ninh* (4): Quan Lan, Dao—IEBR T15; Van Canh, Dao—IEBR T.13, 14 (identification tentative); Van Hai, Dao—ZMVNU 178/3.152.Pc27. *Vinh Phu* (1); Thanh Son—ZMVNU 171/33.150.Pc.21. *Yen Bai* (3): Nam Ngap—IEBR 18, T19; Thuong Bang La—IEBR 835/36/199. Province unknown (26): Tu Chi—ZMVNU 189/34; *VIETNAM*—FCXM 028 (identification tentative), IEBR 440, 2311, 2335, 2358, 2359, unnumbered (4), ZMVNH 179/3.157.Pc46, 181/3.164.0 (identification tentative), 182/3.166.0, 183/3.167.0, 187/3.168,0, 190/35, 191/36, 192/37, 193/38, 194/39, 195/40, 541/3.156. Pc45, unnumbered; [*VIETNAM*]—MNHN 1962/1439, 1962/1448.

Appendix 2: Gazetteer of *Macaca mulatta* Localities

Locality names listed as primary entries in this gazetteer preferentially are official names approved in gazetteers published by the U.S. Board on Geographic Names (USBGN; Afghanistan, 1971; Bangladesh, 1976; Burma [= Myanmar], 1966a; China, 1979; India [includes Bhutan and Nepal], 1952; Laos, 1973; Pakistan, 1983; Thailand, 1966b; Vietnam, 1986). In addition, supplementary references have been consulted for localities in China (Administrative Divisions of the People's Republic of China—1980, 1981; Zonghua Renmin Gongheguo Fen Sheng Dituji, 1983), India (National Atlas of India, 1979; Census of India 1981—various district census handbooks), and Vietnam (Cuc Ban Do-Bo Tong Tham Muu, Quan Doi Nhan Dan Viet Nam, 1980–88). Localities of *M. mulatta* that were not found in USBGN gazetteers or supplementary references are spelled here as in the original sources. Secondary entries, with cross references to corresponding primary entries, indicate variant spellings or alternate locality names that appear on specimen tags, in published literature, or in unpublished notes concerning *M. mulatta*.

The sequence of information presented in primary entries is as follows:

1. Locality name. (Note: Chinese locality names frequently include the following generic geographic terms: Dao = Island; Shan = Mountain; Xian = County.)

2. Altitude, if reported by collector or observer.
3. Name of province, state, or other first-order administrative division, in italics.
4. Name of country, in capital letters.
5. Coordinates of locality (principal sources: USBGN gazetteers, supplementary references indicated above, published or unpublished field notes of collectors or observers).
6. Date of collection or observation.
7. Name of collector or observer.
8. Bibliographic reference (in parentheses) to published or unpublished field notes, if any.
9. Abbreviated name of museum (see "Introduction") where specimens are preserved.
10. Number of specimens available (with indication of part preserved, if skin and skull are not both present).
11. Locality code as indicated in distribution maps (Figs. 2A–C).

Achaltal. See Achal Tank.

Achal Tank, Aligarh; *Uttar Pradesh*, INDIA; 27°53′N, 78°05′E; observed Sept. 1959–June 1960 and Dec. 1970–July 1972 by C. H. Southwick, M. A. Beg, and M. R. Siddiqi (1961a, p. 543; Southwick, 1962, p. 437; Southwick et al., 1976, p. 13). Observed Jan. 1990–Mar. 1991 by E. Imam and H. S. A. Yahya (1995, p. 2). A:I-69.

Adupuria; *Assam*, INDIA; ca. 26°48′N, 94°45′E; reported 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 31). B:I-25.

AFGHANISTAN, eastern; 33°–37°N, 69°–72°E; reported before 1971 by E. Kullmann (1970, p. 23). Not mapped.

AFGHANISTAN, northeastern; 33°–37°N, 69°–72°E; reported Oct. 1808–Aug. 1809 by M. Elphinstone (1842, p. 188). Not mapped.

Agartala. See Charilam.

Aglar River; *Uttar Pradesh*, INDIA; ca. 30°35′N, 78°05′E; observed 30 Apr. 1944 by H. Harrer (1982, p. 40). A:I-27.

Agra; *Uttar Pradesh*, INDIA; 27°11′N, 78°01′E; trapped before 1993 by K. Waheeda (1992, p. 111). A:I-70.

Agra District; *Uttar Pradesh*, INDIA; 26°50′–27°20′N, 77°30′–78°30′E; observed 1981–1983 by P. K. Seth, S. Seth, G. L. Reddy, and P. K. Chopra (1992, p. 62). Not mapped.

Ailao Shan Reserve; *Yunnan*, CHINA; ca. 24°15′N, 101°18′E; observed in 1990 by L. K. Sheeran and F. E. Poirier (1994, p. 21). B:C-72.

Ajanta Caves vicinity; *Maharashtra*, INDIA; ca. 20°33′N, 75°42′E; occurrence before 500 A.D. inferred from cave painting (Fooden et al., 1981, p. 465; Marathe and Mahabal, 1984, p. 74). A:I-100.

Ajodhya. See Ayodhya.

Akhnoor; *Jammu & Kashmir*, INDIA; 32°54′N, 74°44′E; observed before 1983 by Y. R. Malhotra and D. N. Sahi (1982, p. 27). A:I-5.

Akhoiphutia; *Assam, INDIA*; ca. 27°03′N, 94°39′E; reported 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 31). B:I-25.

Ale Chaung. See Ali Cha.

Ali Cha, Chin Hills, 20 mi (= 32 km) southwest of Kindat, 1000 ft (= 300 m); *Chin*, MYANMAR (= BURMA); ca. 23°40′N, 94°05′E; collected 3 Jan. 1915 by J. M. Mackenzie (Wroughton, 1916c, p. 759); BM(NH), 1. B:M-17.

Alicheng River, east of; *Laghman*, AFGHANISTAN; ca. 34°55′N, 70°05′E; reported before 1972 by A. Puget (1971, p. 201). A:A-5.

Aligarh; *Uttar Pradesh*, INDIA; 27°53′N, 78°05′E; observed Dec. 1970–July 1972 by C. H. Southwick, M. F. Siddiqi, M. Y. Farooqui, and B. C. Pal (1976, p. 13). Observed Jan. 1990–Mar. 1991 by E. Imam and H. S. A. Yahya (1995, p. 2) A:I-69.

Aligarh District; *Uttar Pradesh*, INDIA; 27°30′–28°10′N, 77°30′–78°35′E; observed 1959–1984 by C. H. Southwick and M. F. Siddiqi (1983, p. 229; Southwick, 1985, p. 191). Not mapped.

Aligarh vicinity; *Uttar Pradesh*, INDIA; ca. 27°53′N, 78°05′E; blood samples obtained 16–27 Apr. 1964 by K. V. Shah and C. H. Southwick (1965, p. 489). A:I-69.

Alingar, east of; *Laghman*, AFGHANISTAN; ca. 34°55′N, 70°30′E; reported before 1972 by A. Puget (1971, p. 201). A:A-6.

Ali Sagar, Nizamabad District, 440 m; *Andhra Pradesh*, INDIA; 18°42′N, 78°00′E; observed 16 Apr. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 466). A:I-116.

Alwar District; *Rajasthan*, INDIA; ca. 27°38′N, 76°35′E; observed 1981–1983 by P. K. Seth, S. Seth, G. L. Reddy, and P. K. Chopra (1992, p. 62). A:I-73.

Ambagarh Reserve Forest, 9 km northeast of Jaipur; *Rajasthan*, INDIA; ca. 27°00′N, 75°53′E; observed 1985–1993 by A. Lobo, B. R. Manohar, and R. Mathur (Mathur & Lobo, 1990, p. 308; Manohar & Mathur, 1992, p. 114; Mathur, 1994, p. 132). A:I-75.

Ambala District; *Haryana*, INDIA; ca. 30°51′N, 76°30′E; observed 1981–1983 by P. K. Seth, S.

Seth, G. L. Reddy, and P. K. Chopra (1992, p. 62). A:I-20.

Amber. See Amer.

Amer, Jaipur District; *Rajasthan*, INDIA; 26°59′N, 75°52′E; observed 1975–1980 by P. K. Seth and S. Seth (1983, p. 63). A:I-75.

Ampi Bazar, ca. 3 km southeast of resthouse; *Tripura*, INDIA; ca. 26°40′N, 91°38′E; collected 18 Jan. 1971 by V. C. Agrawal (Agrawal & Bhattacharyya, 1977, p. 137); ZSI, 1. B:I-40.

Anapalam, Rajupalem Taluk, Guntur District; *Andhra Pradesh*, INDIA; ca. 16°20′N, 80°00′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 19). A:I-145.

Angaluru, Guntur District, 125 m; *Andhra Pradesh*, INDIA; 16°12′N, 79°47′E; observed 30 Apr. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 468). A:I-147.

Anganganj. See Khair, Tahsil.

Ang Co, Cat Ba Island; *Hai Phong*, VIETNAM; 20°43′N, 107°03′E; purchased in market 13 July 1964 by unknown collector (Dang, 1983, p. 1282; Dao, 1985, p. 82; Nisbitt & Ciochon, 1993, p. 772); ZMVNU, 1. Collected 11 Aug. 1964 by Hien Hao (Dao, 1985, p. 82; Nisbitt & Ciochon, 1993, p. 772); ZMVNU, 1 (skull only). C:V-14.

Anhui, CHINA; 29°–35°N, 115°–120°E; collected 1959–1960 by museum collectors; SMNH, 8 (7 skins only, 1 skull only). Not mapped.

Anji Xian; *Zhejiang*, CHINA; ca. 30°40′N, 119°40′E; ca. 50 captives acquired 1950–1959 from Local Products Supply Co. by Hangzhou Zoo (Fu Yiyuan, Director, pers. comm., 25 Oct. 1985). C:C-56.

Ankapur, Armur Taluk, Nizamabad District; *Andhra Pradesh*, INDIA; 18°45′N, 78°16′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18). A:I-115

Anlong; *Guizhou*, CHINA; 25°06′N, 105°31′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-157.

Annapurna Conservation Area. See Pokhara.

Annavangal, Banswada Taluk, Nizamabad District; *Andhra Pradesh*, INDIA; not precisely located, 18°05′–18°35′N, 77°45′–78°05′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18). Not mapped.

Anyuan; *Jiangxi*, CHINA; 25°09′N, 115°21′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-98.

Arbesi. See Basirhat Reserve Forest.

Arunachal Pradesh, INDIA; 26°55′–29°30′N, 91°35′–97°25′E; reported during "past few years" by A. Borang and G. S. Thapliyal (1993, p. 839). Not mapped.

Asarori Forest, 425–950 m; *Uttar Pradesh*, INDIA; ca. 30°15′N, 78°00′E; observed June 1965–May 1966 by D. G. Lindburg (1971, p. 5). Observed June 1973–Oct. 1976 by S. C. Makwana, R. S. Pirta, and M. Singh (Pirta, 1977–78, p. 125; 1984, p. 272; Makwana, 1978, p. 483; 1979a, p. 242; Makwana & Pirta, 1978, p. 164; 1983, p. 301; Pirta & Singh, 1981, p. 340). A:I-27.

Ashi; *Yunnan*, CHINA; ca. 26°53′N, 100°00′E; collected in 1921 (see USNM catalog) by J. F. Rock (1925, p. 447; 1926, p. 139; Chock, 1963, p. 93); USNM, 2. B:C-44.

Ashoknagar, Warangal District, 340 m; *Andhra Pradesh*, INDIA; 17°55′N, 79°57′E; observed 19 Apr. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 467). A:I-133.

Asmar, east of; *Konarha*, AFGHANISTAN; ca. 35°00′N, 71°30′E; reported before 1972 by A. Puget (1971, p. 201). A:A-1.

Asmar, northwest of; *Konarha*, AFGHANISTAN; ca. 35°10′N, 71°20′E; reported before 1972 by A. Puget (1971, p. 201). A:A-1.

Assam, INDIA; 24°10′–28°00′N, 89°40′–96°00′E; acquired before 1859 by Zoological Society of London; BM(NH), 1 (skull only). Acquired before 1956 by Calcutta Zoological Garden (Khajuria, [1955], pp. 113, 114); ZSI, 1. Not mapped.

Assembly. See Simla.

Aurn River, ca. 20 km above mouth, Karnali Bardia Game Reserve; *Bardia*, NEPAL; ca. 28°30′N, 81°19′E; observed 20 Feb.–10 Mar. 1976 by J. Teas (1983, p. 214). A:N-5.

Ayodhya; Uttar Pradesh, INDIA; 26°48′N, 82°12′E; reported before 1978 by M. L. Roonwal and S. M. Mohnot (1977, p. 100). A:I-60.

Ayodhya-Gorakpur, highway between; *Uttar Pradesh*, INDIA; ca. 26°45′N, 82°45′E; observed Sept. 1959–June 1960 by C. H. Southwick, M. A. Beg, and M. R. Siddiqi (1961b, p. 702). A: I-62.

Azamgarh vicinity; *Uttar Pradesh*, INDIA; ca. 26°04′N, 83°11′E; observed Sept. 1959–Feb. 1960 by C. H. Southwick, M. A. Beg, and M. R. Siddiqi (1961a, p. 540). A:I-63.

Babai River vicinity, Karnali Bardia Game Reserve; *Bardia*, NEPAL; ca. 28°26′N, 81°21′E; observed 20 Feb.–10 Mar. 1976 by J. Teas (1983, p. 214). A:N-5.

Babuwali, Jasalmer District; *Rajasthan*, INDIA; ca. 26°47′N, 69°44′E; falsely reported 4 Sept.

1980 by K. Singh (Bhargava, 1982, p. 7; 1984, p. 43). Not mapped.

Bac Can, Tonkin region, 500 ft (= 150 m); *Bac Thai*, VIETNAM; 22°08′N, 105°49′E; collected 13 Dec. 1926–14 Jan. 1927 by J. Delacour and W. P. Lowe (Delacour & Jabouille, 1927, p. 302); BM(NH), 3 (including 1 skin only): MNHN, 1. C:V-10.

Bachepalli. See Dachepalle.

Bachi, Pingyuan [Xian]; *Guangdong*, CHINA; 24°46′N, 115°49′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-97.

Bach Ma National Park; *Thua Thien-Hue*, VIETNAM; ca. 16°12′N, 107°52′E; reported ca. 1990–1995 by L. K. Lippold (1995, p. 199). C: V-35.

Bac Tan Trai (= Bac Tan Tray), Tonkin region; *Lai Chau*, VIETNAM; 22°24′N, 103°12′E; collected 5 Nov. 1931 by T. D. Carter (Legendre, 1936, p. 83); ANSP, 1. C:V-1.

Badu. See Batu.

Bageshwar (= Bageswar), Kumaun region, 3200 ft (= 975 m); *Uttar Pradesh*, INDIA; 29°51′N, 79°46′E; collected Aug. 1913–Mar. 1914 by C. A. Crump (in Wroughton, 1914, p. 283); BM(NH), 5 (including 2 skulls only). A:I-31.

Baguri Block, Kaziranga Wild Life Sanctuary; *Assam*, INDIA; ca. 26°37′N, 93°15′E; reported Jan.–June 1966 by J. J. Spillett (1967, p. 496). B:I-21.

Bahgara; *Assam*, INDIA; ca. 26°53′N, 94°45′E; reported 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 31). B:I-25.

Baidonghe Water Regulation Forest Reserve; *Guangxi*, CHINA; ca. 23°55′N, 106°44′E; observed in 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 127; letter, Aug. 1996). C:C-169.

Baima; *Qinghai*, CHINA; ca. 33°02′N, 100°04′E; collected 11 Sept. 1967 by Wang Zongyi; IZCAS, 1. B:C-23.

Bairaglia. See Hazaria Patherghatta.

Baisha, Hainan Dao; *Hainan*, CHINA; 19°13′N, 109°26′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-233.

Baishuijiang Natural Reserve, 1700–2900 m and 3000–3400 m; *Shaanxi*, CHINA; ca. 33°35′N, 105°54′E; reported before 1989 by Ma Guoyao (1988, p. 27). C:C-18,

Baizha Plantation, Nangqen Xian, 3600–4400 m; *Qinghai*, CHINA; 32°04′N, 96°21′E; observed in early 1960s by Zheng Changlin (pers. comm., 7 Oct. 1985). B:C-15.

Baj Garhi Bridge; *Uttar Pradesh*, INDIA; 28°03′N, 78°03′E; observed 1959–1975 by C. H. Southwick and M. F. Siddiqi (1977, p. 342). A:I-69.

Bak shöi mun. See Luofu Shan.

Balimila (= Balimela) vicinity; *Orissa*, INDIA; ca. 18°15′N, 82°08′E; observed 1959–1970 by M. Krishnan (1972, p. 540). A:I-109.

Balkonda, Armur Taluk, Nizamabad District; *Andhra Pradesh*, INDIA; 18°52′N, 78°21′E; observed 1972–1973 by N. Koyama and P. B. Shekar (1981, p. 248). Reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18). A:I-115.

Ballapet, Khammam Taluk, Khammam District; *Andhra Pradesh*, INDIA; 17°16′N, 80°12′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18). A:I-132.

Balphakram region; Meghalaya INDIA; ca. 25°10′N, 90°15′E; observed ca. 1977 by A. K. Ghosh and S. Biswas (1977, p. 24). B:I-12.

Balrampur forest; *Uttar Pradesh*, INDIA; ca. 27°26′N, 82°11′E; observed 1973–1974 by R. K. Singh and N. N. Sen (1977–78, p. 136). A: I-61.

Balthali, Kavre; *East No. 1*, NEPAL; 27°30′N, 85°30′E; observed May 1998 by M. K. Chalise and M. Ghimire (1998, p. 12). A:N-supplementary.

Bamo village, near, Bamo Subcounty, Tiané Xian; *Guangxi*, CHINA; 24°55′N, 107°21′E; collected in 1987 by Yang Changbi, subsequently purchased by Huang Runqiang (pers. comm., 24 Oct. 1992); IZCAS, 1 (skull only). C:C-173.

Ban Bu, Khe Choang (river), Con Cuong District, 500 m; *Nghe An*, VIETNAM ca. 19°03′N, 104°45′E; collected 11 Dec. 1992 by Pham Nhat and Mr. Hung; FCXM, 1 (skull only; external measurements recorded in card catalog). C: V-26.

Ban Bung vicinity, Na Hang District; *Tuyen Quang*, VIETNAM; ca. 22°20′N, 105°20′E; reported 25 Feb.–5 Apr. 1992 by R. Ratajszczak, Ngoc Can, and Pham Nhat (1992, p. 16). C:V-6.

Banda District; *Uttar Pradesh*, INDIA; 24°55′–25°55′N, 80°05′–81°35′E; observed before 1916 by G. B. F. Muir (1916, p. 353). Observed 1960–1980 by M. F. Siddiqi (Southwick, 1985, p. 191). Not mapped.

Banda vicinity; *Uttar Pradesh*, INDIA; ca. 25°29′N, 80°20′E; observed Sept. 1959–Feb. 1960 by C. H. Southwick, M. A. Beg, and M. R. Siddiqi (1961a, p. 540). A:I-84.

Bandhavgarh National Park; *Madhya Pradesh*, INDIA; ca. 23°40′N, 81°02′E; reported Feb.–

Mar. 1976 by N. K. Sinha (1977, p. 5). Reported before 1997 by K. K. Gurung and R. Singh (1996, p. 80). A:I-93.

Bandipul, Tahsil Thana Ghazi; *Rajasthan*, INDIA; ca. 27°25′N, 76°19′E; observed 1975–1980 by P. K. Seth and S. Seth (1983, p. 63). A:I-74.

Bangma; *Sichuan*, CHINA; not located, 26°00′–34°10′N, 97°40′–110°05′E; reported before 1992 by Jiang Xuelong, Wang Yingxiang, and Ma Shilai (1991, p. 243). Not mapped.

Bangram. See Dhaka.

Bangsal. See Dhaka.

Ban Kuai, Several km south of, 170–609 m; *Vientiane*, LAOS; ca. 18°16′N, 102°08′E; observed Feb.–July 1996 by J. W. Duckworth (1996, p. 229). B:L-6.

Ban Mae Lamao, 350 m; *Tak*, THAILAND; 16°48′N, 98°45′E; collected 21 Mar. 1967 by J. Fooden (1971, p. 18). FMNH, 1. B:T-6.

Ban Mak Nao, Camp No. 34; *Vientiane*, LAOS; 18°00′N, 102°58′E; collected 16 Feb. 1920 by J. Bangassar (Weitzel et al., 1988, p. 116); ZRC, 1. B:L-8.

Ban Manao. See Ban Mak Nao.

Bannabari. See Bharnabhari.

Ban Napo vicinity, 170–609 m; *Vientiane*, LAOS; ca. 18°17′N, 102°11′E; observed Feb.–July 1996 by J. W. Duckworth (1996, p. 229). B:L-6.

Ban So vicinity, 170–609 m; *Vientiane*, LAOS; ca. 18°19′N, 102°06′E; observed Feb.–July 1996 by J. W. Duckworth (1996, p. 229). B:L-6.

Ban Thi, Cho Don District; *Bac Thai*, VIETNAM; 22°14′N, 105°31′E; collected 2 May 1970 by Nguyen Trong Tien; ZMVNU, 1 (skull only, species identification tentative). Collected 20 May 1970 by Mr. Nhe; ZMVNU, 1 (skin only). C:V-6.

Ban Umphang, 28 mi (= 45 km) southeast of, 1750 ft (= 530 m); *Kamphaeng Phet*, THAILAND; ca. 15°28′N, 99°04′E; collected 4 Feb. 1924 by A. S. Vernay (Lowe, 1932, p. 197; 1933, p. 260); AMNH, 1. B:T-8.

Ban Vay (= Ban Vai), Khang Ninh vicinity; *Cao Bang*, VIETNAM; 22°27′N, 105°39′E; collected 12 Aug. 1971 by Nguyen Van Chau; ZMVNU, 1. C:V-8.

Ban Wangma vicinity, 170–609 m; *Vientiane*, LAOS; ca. 18°23′N, 102°06′E; observed Feb.–July 1996 by J. W. Duckworth (1996, p. 229). B:L-6.

Baoshan; *Yunnan*, CHINA; 25°07′N, 99°09′E; tissue sample obtained ca. 1991 (Zhang & Shi, 1993b, p. 589). Immunological survey conducted before 1996 by Duan Xingsheng, Liu Yuanwei, Wu Jing, Dao Weiying, and Liu Jianghai (1995, p. 411). B:C-56.

Bapon, Fusui Xian; *Guangxi*, CHINA; ca. 22°35′N, 107°57′E; collected Aug. 1986 by Wu Mingchuan (pers. comm., 27 Nov. 1992); FDCG, 1 (skull only). C:C-219.

Bara Math Temple. See Chitrakut.

Barami. See Barmi.

Barauli Bridge; *Uttar Pradesh*, INDIA; ca. 28°05′N, 78°03′E; observed 1959–1975 by C. H. Southwick and M. F. Siddiqi (1977, p. 342). A:I-69.

Barautha. See Barotha.

Bar Chanrai Hill, lower Swat Valley opposite Malakand; *North-West Frontier*, PAKISTAN; ca. 34°34′N, 71°56′E; reported before 1902 by A. H. McMahon (1901b, p. 9). A:P-6.

Bardia National Park. See Babai River vicinity.

Bareilly; *Uttar Pradesh*, INDIA; 28°21′N, 79°25′E; trapped for psychological study before 1993 by K. Waheeda (1992, p. 111). A:I-52.

Bareilly-Agra, highway between; *Uttar Pradesh*, INDIA; ca. 28°50′N, 78°30′E; observed 1964–1965 by R. P. Mukherjee and G. D. Mukherjee (1972, p. 67). A:I-48.

Barikowt (= Baricot), southeast of; *Konarha*, AFGHANISTAN; ca. 35°10′N, 71°35′E; reported before 1972 by A. Puget (1971, p. 201). A:A-1.

Barmdeo Mandi; *Kanchanpur*, NEPAL; 28°52′N, 80°09′E; observed June 1964–Dec. 1965 by D. L. Chesemore (1970, p. 164). A:N-2.

Barmi; *Gazipur*, BANGLADESH; ca. 24°08′N, 90°22′E; observed Sept. 1975 by J. R. Oppenheimer, A. K. Akonda, and K. Z. Husain (1983, p. 194). B:Ba-15.

Barotha; *Uttar Pradesh*, INDIA; 27°57′N, 78°10′E; observed 1959–1975 by C. H. Southwick and M. F. Siddiqi (1977, p. 342). A:I-69.

Barri Chopal, Jaipur District; *Rajasthan*, INDIA; ca. 26°50′N, 75°50′E; observed 1975–1980 by P. K. Seth, S. Seth, and A. K. Shukla (1983, p. 38). A:I-75.

Bashgal Valley. See Kaotai.

Basirhat (= Basinhat) Reserve Forest; *West Bengal*, INDIA; ca. 22°40′N, 88°53′E; observed 1955–1960 by A. K. Mukherjee (Mukherjee & Gupta, 1965, p. 145). B:I-4.

Baska Nadi. See Bogra Nadi.

Batang vicinity, 2200–3000 m; *Sichuan*, CHINA; ca. 30°00′N, 99°00′E; reported 1914–1916 by H. Weigold (1924, p. 71). Purchased at Batang market in 1961 by unknown collector; IZCAS, 1 (skin only). B:C-32.

Batu, Pinglang District, Tianlin Xian; *Guangxi*,

CHINA; ca. 24°18′N, 106°13′E; collected 31 July 1978 and ca. Oct. 1978 by Neuong Shihua (Quan Guoqiang, pers. comm., 29 Nov. 1985); FDCG, 2 (1 skin only, 1 skull only). C:C-170.

Bawangling, Changjiang Xian, Hainan Dao, 500–600 m; *Hainan*, CHINA; 19°07′N, 109°05′E; collected 1 Jan. 1964 by Liu Zhenhe; SCIEA, 1. C:C-234.

Bawmwang, 3200 ft (= 975 m); *Kachin*, MYANMAR (= BURMA); 26°39′N, 97°50′E; collected 6 Feb. 1939 by R. Kaulback; BM(NH), 1. B:M-1.

Beichuanshan, Taishan Xian, Shangchuan Dao, 0–500 m; *Guangdong*, CHINA; 21°45′N, 112°50′E; observed Apr.–May 1981 by Liu Zhenhe, SCIEA (pers. comm., 25 Nov. 1985). C:C-213.

Beijing (= Pekin), monastery outside of; *Beijing*, CHINA; 39°56′N, 116°24′E; erroneous locality information (Morris & Morris, 1966, p. 18; Hill, 1974, p. 583) for monkeys (presumably either *M. mulatta* or *M. thibetana*) observed ca. 1325 at monastery in Hangzhou vicinity by Odoric of Pordenone (1928, pp. 232, 234). Not mapped.

Benaras. See Varanasi.

Benares. See Saktesgarh; Varanasi.

Bengal. See *West Bengal*.

"(Bengal)", INDIA or BANGLADESH; 22°–27°N, 86°–93°E; date and collector unknown; captive, Zoological Society of Philadelphia; ANSP, 1 (skin only). Not mapped.

Bengalen; INDIA or BANGLADESH; 22°–27°N, 86°–93°E; collected in 1859 by unknown collector; NHMBa, 2. Captive obtained (date unknown) in Sumatra by Prof. Neisser, reportedly imported from "Bengalen"; MZB, 1 (skull only). Not mapped.

Berhampur, Ganjam District, 25 m; *Orissa*, INDIA; 19°19′N, 84°47′E; observed 20 May 1980 by J. Fooden. A:I-107.

Bezogaon; *Assam*, INDIA; ca. 26°56′N, 94°33′E; reported 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 31). B:I-25.

Bhagalpur District; *Bihar*, INDIA; ca. 25°15′N, 87°00′E; reported 1810–1811 by F. Buchanan (1939, p. 285; posthumous publication). B:I-5.

Bhamo, 600 ft (= 180 m); *Kachin*, MYANMAR (= BURMA); 24°16′N, 97°14′E; collected 15 Feb. 1936 by P. F. Garthwaite; BM(NH), 1. B:M-15.

Bharatpur; *Rajasthan*, INDIA; 27°13′N, 77°29′E; reported before 1965 by I. Prakash (letter, 25 Aug. 1964). Reported before 1997 by K. K. Gurung and R. Singh (1996, p. 100). A:I-72.

Bharnabhari (= Bharnabhavi), Bhutan Duars, 600 ft (= 180 m); *West Bengal*, INDIA; ca. 26°45′N, 89°23′E; collected 21 Feb. 1916 by N. A. Baptista (H. V. O'Donel in Wroughton, 1917, p. 63); BM(NH), 1. B:I-9.

Bheri River; *Sallyana*, NEPAL; ca. 28°30′N, 82°00′E; observed Feb. 1977 by P. Byrne (1979, p. 70). A:N-7.

Bherjan. See Tinsukia.

Bhim Kund Point, Amravati District, 875 m; *Maharashtra*, INDIA; 21°24′N, 77°20′E; observed 31 Jan. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 466). A:I-101.

Bhiwani District; *Haryana*, INDIA; ca. 28°47′N, 76°08′E; observed 1981–1983 by P. K. Seth, S. Seth, G. L. Reddy, and P. K. Chopra (1992, p. 62). A:I-40.

Bhopal, east of; *Madhya Pradesh*, INDIA; ca. 23°20′N, 77°40′E; reported ca. 1922 by B. C. Ellison (1922, p. 1100; cf. Fooden, 1989, p. 44). A:I-96.

Bhowal area. See Naini Tal.

Bhotan Duars. See Bharnabhari; Hasimara.

Bhutan Duars. See Bharnabhari; Hasimara.

Bialibazar Rubber Plantation; *Sylhet*, BANGLADESH; not precisely located, 24°08′–24°50′N, 91°37′–92°17′E; observed Feb. 1990–June 1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, p. 76). Not mapped.

Bijnor, 1000 ft (= 300 m); *Uttar Pradesh*, INDIA; 29°22′N, 78°08′E; collected before 1927 by B. B. Osmaston (Napier, 1981, p. 23); BM(NH), 1 (skull only). A:I-34.

Bikaner; *Rajasthan*, INDIA; 28°01′N, 73°18′E; observed 1953–1956 by I. Prakash (1956, p. 3; 1959, p. 39). Reported before 1982 by R. N. Bhargava (1984, pp. 41, 42). A:I-78.

Bilauri; *Kanchanpur*, NEPAL; 28°35′N, 80°22′E; observed June 1964–Dec. 1965 by D. L. Chesemore (1970, p. 164). A:N-3.

Biloxue Shan, near Nujiang (= Salween River), Bijiang Xian; 3000 m; *Yunnan*, CHINA; ca. 26°35′N, 99°05′E; collected 19 Oct. 1978 by Ma Shilai (pers. comm., 1 Sept. 1983); KIZ, 1 (skin only). B:C-43.

Bishenpur (= Bistenpur), 3000 ft (= 900 m); *Manipur*, INDIA; 24°38′N, 93°46′E; collected 20 Feb. 1940 by W. J. C. Frost; BM(NH), 2. B:I-38.

Biyun, ca. 30 km north of; *Anhui*, CHINA; ca. 30°25′N, 118°20′E; observed before 1973 by

Xiong Chenpei (Wada et al., 1986, p. 82). C:C-53.

Biyun, Jingde Xian, 300–400 m; *Anhui*, CHINA; ca. 30°10′N, 118°20′E; observed 1973–1986 by Xiong Chenpei (Wada et al., 1986, p. 83). C:C-62.

Boai; *Henan*, CHINA; 35°10′N, 113°04′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-11.

Boga Juli. See Bogra Nadi.

Bogra Nadi (?= Boga Juli), North Kamrup, 2000 ft (= 600m); *Assam* INDIA; ca. 26°48′N, 91°35′E; collected 5 Jan. 1921 by H. W. Wells (Hinton & Lindsay, 1926, p. 385); BM(NH), 1. B:I-16.

Bohea Mts. See Kuatun.

Boileauganj, Simla vicinity; *Himachal Pradesh*, INDIA; ca. 31°06′N, 77°08′E; observed Aug. 1972–Feb. 1973 by K. Wada (1984, p. 477). A:I-18.

Boluo, Yingde Xian; *Guangdong*, CHINA; 24°25′N, 113°00′E; reported in 1970 by local residents to Liu Zhenhe, SCIEA (pers. comm., 25 Nov. 1985). C:C-205.

Bolovens. See Muang Thateng.

Bombay. See Mumbai.

Bondor (= Bondar); *Narayanganj*, BANGLADESH; ca. 23°35′N, 90°35′E; reported before 1986 by M. A. R. Khan (1981, p. 13; 1985, p. 31). Observed Feb. 1990–June 1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, p. 76). B:Ba-27.

Borajan. See Tinsukia.

Borivli National Park; *Maharashtra*, INDIA; 19°10′N, 72°55′E; population artificially introduced in 1940s (Serrao & Amladi, 1979, p. 29). Observed 1972–1973 by N. Koyama and P. B. Shekar (1981, p. 248). Observed 25 Dec. 1979 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 469). Not mapped.

Borme; *Gazipur*, BANGLADESH; ca. 24°05′N, 90°25′E; reported before 1986 by M. A. R. Khan (1985, p. 31). Observed Feb. 1990–June 1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, p. 76). B:Ba-15.

Bormibazar. See Borme.

Boska Nadi. See Bogra Nadi.

Bo Trach District; *Quang Binh*, VIETNAM; ca. 17°35′N, 106°33′E; collected 25 Mar. 1976 by unknown collector; IEBR, 1 (skull only). C:V-30.

Bouzini, Katmandu Valley; *Bagmati*, NEPAL; ca. 27°41′N, 85°11′E; collected 18 June 1922 by N. A. Baptista (Hinton & Fry, 1923, p. 403); BM(NH), 1. A:N-12.

Brindaban. See Vrindavan.

Bulandshahr District; *Uttar Pradesh*, INDIA; ca. 28°23′N, 77°52′E; observed 1981–1983 by P. K. Seth, S. Seth, G. L. Reddy, and P. K. Chopra (1992, p. 62). A:I-46.

Buliuhe Water Regulation Forest Reserve; *Guangxi*, CHINA; ca. 24°57′N, 106°54′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 127; letter, Aug. 1996). C:C-173.

Bulun. See Sungri, ca. 2 km south of.

BURMA. See MYANMAR.

Busapuri. See Bussapuram.

Bussapuram, Mulug Taluk, Warangal District; *Andhra Pradesh*, INDIA; 18°10′N, 80°05′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18). A:I-120.

Cachar District; *Assam*, INDIA; ca. 25°30′N, 93°00′E; collected Aug.–Sept. 1920 by H. W. Wells (Hinton & Lindsay, 1926, p. 385); BNHS, 1 (skull only). B:I-35.

Cala Shan, Zhungshan Township, Luxi Xian, 1500–2000 m; *Yunnan*, CHINA; ca. 24°30′N, 98°40′E; collected 15 Sept. 1960 by Quan Guoqiang (pers. comm., 25 Aug. 1983); IZCAS, 2. B:C-63.

Calcutta, Hastings Road; *West Bengal*, INDIA; 22°32′N, 88°22′E; observed in 1962 and Dec. 1970–July 1972 by C. H. Southwick, A. Ghosh, and C. D. Louch (1964, p. 444; Southwick et al., 1976, p. 13). B:I-3.

Calcutta, Indian Museum compound; *West Bengal*, INDIA; 22°32′N, 88°22′E; collected 25 July 1962 by B. S. Lamba; ZSI, 1 (skull only). Observed Dec. 1968–Nov. 1969 by S. S. Saha (1974, p. 211). B:I-3.

Calcutta, northern; *West Bengal*, INDIA; 22°32′N, 88°22′E; observed ca. 1991–1995 by J. Datta (1996, p. 941). B:I-3.

Calcutta vicinity; *West Bengal*, INDIA; ca. 22°32′N, 88°22′E; reportedly "not obtainable [by collectors] near Calcutta," Dec. 1890–Jan. 1891 (Heape, 1894, p. 412). Not mapped.

Camp No. 28. See Nong Khai.

Camp No. 34. See Ban Mak Nao.

Cao Bang, VIETNAM; 22°15′–23°05′N, 105°15′–106°50′E; reported 1892–1893 by A. Billet (1896, p. 61). Not mapped.

Cat Ba, Dao, Vung (= Bay) Ha Long; *Hai Phong*, VIETNAM; ca. 20°45′N, 107°00′E; purchased in market 28 Jan. 1957 by unknown collector; ZMVNU, 3 (including 2 skins only). Collected in 1958 by unknown collector (Dang, 1983, p. 1282); ZMVNU, 1 (skin only). Collected 11 Aug.

1964 by Hien Hao; ZMVNU, 3 (skulls only). C: V-14.

Cecil, Simla; *Himachal Pradesh*, INDIA; ca. 31°06′N, 77°09′E; observed Aug. 1972–Feb. 1973 by K. Wada (1984, p. 477). A:I-18.

Ceheng; *Guizhou*, CHINA; 24°58′N, 105°49′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-159.

Cenwanglao Shan Nature Reserve; *Guangxi*, CHINA; ca. 24°19′N, 106°35′E; observed in 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 126; letter, Aug. 1996). C:C-171.

Chaibasa. See Luia.

Chail Sanctuary; *Himachal Pradesh*, INDIA; ca. 31°00′N, 77°15′E; reported 1978–1980 by A. J. Gaston, P. J. Garson, and M. L. Hunter, Jr. (1983, p. 300). A:I-18.

Chakia Forest Range; *Uttar Pradesh*, INDIA; ca. 25°03′N, 83°13′E; observed Aug. 1977–July 1978 by R. S. Pirta (1982, p. 401; Pirta & Singh, 1982, p. 15). A:I-88.

Chakmani. See Chamkani.

Cham Chu, Chiem Hoa District; *Tuyen Quang*, VIETNAM; 22°12′N, 105°07′E; reported Feb.–Apr. 1992 by R. Ratajszczak, Ngoc Can, and Pham Nhat (1992, p. 18). C:V-5.

Chamkani, northeast of; *Paktia*, AFGHANISTAN; ca. 33°55′N, 69°50′E; reported before 1972 by A. Puget (1971, p. 201). A:A-11.

Chamkani, southeast of; *Paktia*, AFGHANISTAN; ca. 33°45′N, 70°05′E; reported before 1972 by A. Puget (1971, p. 201). A:A-12.

Chandigarh, outskirts of; *Punjab*, INDIA; ca. 30°44′N, 76°55′E; observed 1985–1986 by R. Boonratana and C. J. Edwin (1986, p. 110). A: I-19.

Chandikhola, Birganj Forest District; *Rautahat*, NEPAL; 27°04′N, 85°22′E; observed June 1964–Dec. 1965 by D. L. Chesemore (1970, p. 164). A:N-13.

Chandpur Bazar, Old; *Chandpur*, BANGLADESH; 23°13′N, 90°39′E; observed Feb. 1990–June 1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, p. 76). B:Ba-28.

Changchang Pani; *Nagaland*, INDIA; 26°36′N, 94°26′E; collected 15–18 Feb. 1930 by C. McCann (1933a, p. 395); AMNH, 2. B:I-31.

Changde; *Hunan*, CHINA; 29°02′N, 111°41′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-108.

Changhua vicinity, Lin'an Xian; *Zhejiang*, CHINA; ca. 30°10′N, 119°13′E; skin collected locally in 1979 observed Apr. 1980 by Tang Zieying, FUBD (pers. comm., 19 Oct. 1985). C:C-59.

Chang Jiang. See Yichang.

Changlung. See Nu Jiang.

Changning [Xian]; *Yunnan*, CHINA; ca. 24°50′N, 99°36′E; blood sample obtained before 1999 by Ding Bo, Zhang Yaping, and Hou Yidi (1998, p. 172). B:C-64.

Changshun; *Guizhou*, CHINA; 25°59′N, 106°25′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-146.

Changtian, Dongfang Xian, Hainan Dao, 400–500 m; *Hainan*, CHINA; 19°02′N, 108°54′E; collected 23–24 Jan. 1964 by Liu Zhenhe, SCIEA (pers. comm., 26 Nov. 1985); SCIEA, 4. C:C-235.

Chapai. See Nawabganj vicinity.

Charilam resthouse, ca. 25 km south of Agartala; *Tripura*, INDIA; 23°38′N, 91°18′E; collected 16 Nov. 1969 by V. C. Agrawal (Agrawal & Bhattacharyya, 1977, p. 137); ZSI, 1. B:I-40.

Charkonda, Mahbubnagar District, 420 m; *Andhra Pradesh*, INDIA; 16°42′N, 78°43′E; observed 28 and 29 Apr. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 468). A:I-127.

Char mugoria; *Madaripur*, BANGLADESH; ca. 23°10′N, 90°12′E; observed Feb. 1990–June 1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, pp. 76, 79). B:Ba-25.

Chaunpur; *Uttar Pradesh*, INDIA; 27°57′N, 78°08′E; observed Jan. 1990–Mar. 1991 by E. Imam and H. S. A. Yahya (1995, p. 2). A:I-69

Chaur; *Dandeldhura*, NEPAL; 29°17′N, 80°21′E; observed June 1964–Dec. 1965 by D. L. Chesemore (1970, p. 164). A:N-1.

Chengbihe Water Regulation Forest Reserve; *Guangxi*, CHINA; ca. 24°02′N, 106°36′E; observed in 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 127, letter, Aug. 1996). C:C-169.

Chengbu; *Hunan*, CHINA; 26°26′N, 110°21′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-186.

Chengjaba, Nanzheng Xian, 900 m; *Shaanxi*, CHINA; ca. 32°30′N, 107°15′E; observed June 1981 by Yao Jianchu, SIZ (pers. comm., 10 Oct. 1985). C:C-34.

Chengli, 2 mi (= 3 km) west of Ghurkha; *Gandaki*, NEPAL; ca. 28°00′N, 84°35′E; collected 7 Dec. 1922 by N. A. Baptista; BM(NH), 1. A: N-9.

Chengxian; *Gansu*, CHINA; 33°42′N, 105°36′E;

reported before 1998 (Zhang et al., 1997, p. 58). C:C-20.

Cherekapar, near; *Assam*, INDIA; ca. 26°59′N, 94°40′E; observed 9 Mar.–16 Feb. 1988 by A. Choudhury ([1991a], p. 32). B:I-25.

Chetia; *Assam*, INDIA; ca. 27°01′N, 94°44′E; reported 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 31). B:I-25.

Chhatari-do-Raha; *Uttar Pradesh*, INDIA; ca. 28°07′N, 78°09′E; observed 1959–1984 by R. L. Johnson, M. F. Siddiqi, and C. H. Southwick (Southwick et al., 1976, p. 13; 1986, p. 433; Southwick & M. F. Siddiqi, 1977, p. 342; Siddiqi & Southwick 1980, p. 54; 1988, p. 121; Johnson & Southwick, 1984, p. 201; Southwick, 1985, p. 191; Johnson, 1986, p. 193). Observed Jan. 1990–Mar. 1991 by E. Imam and H. S. A. Yahya (1995, p. 2). A:I-69.

Chhota Bangahal, upper Beas River catchment area; *Himachal Pradesh*, INDIA; not precisely located, 31°30′–32°30′N, 77°00′–77°30′E; reported 1978–1980 by A. J. Gaston, P. J. Garson, and M. L. Hunter, Jr. (1983, p. 300). Not mapped.

Chiang Dao; *Chiang Mai*, THAILAND; 19°22′N, 98°58′E; collected 14 June 1937 by C. R. Carpenter (1940, p. 20; Coolidge, 1940, p. 129); MCZ, 1. B:T-1.

Chiang Mai, near; *Chiang Mai*, THAILAND; ca. 18°47′N, 98°59′E; collected in 1931 by H. G. Deignan (Chasen, 1935, p. 38); ZRC, 1. B:T-2.

Chiem Hoa; *Tuyen Quang*, VIETNAM; 22°09′N, 105°17′E; collected in 1962 by unknown collector; ZMVNU, 1. C:V-5.

Chieng Dao. See Chiang Dao.

Chiengmai. See Chiang Mai, near.

Chiengmai, below. See Kaeng Mae Hat.

Chigha Sarai, north of; *Konarha*, AFGHANISTAN; ca. 34°52′N, 71°10′E; collector and date unknown, captive purchased 4 mi (= 6.5 km) north of Kandahar by J. Hassinger (1968, p. 72), 2 Nov. 1965; FMNH, 1. A:A-8.

Chihli. See Xinglong Xian, southern.

CHINA; 18°–41°N, 85°–120°E; captive shipped from Shanghai before 24 Jan. 1880 by unknown collector; BM(NH), 1 (skin only). Captive purchased in Lhasa (extralimital) 1938–1939 by E. Schäfer; ZSBS, 1. Collected 1950–1978 by museum collectors; SMNH, 23 (13 skins only, 10 skulls only). Collected in 1960 by unknown collectors; IZCAS, 4 (skins only). Date and collector unknown; BMNH, 2 (including 1 skull only); SCIEA, 1 (skin only). Not mapped.

?CHINA; 18°–41°N, 85°–120°E; no data, possibly collected May–July 1890 at Ngamda or Rouétoundo (see below) by G. Bonvalot and H. d'Orleans (Bonvalot, 1891, vol. 2, p. 210; 1892, p. 505); MNHN, 1 (skin only). Not mapped.

CHINA, northern; 30°–45°N, 100°–125°E; obtained date unknown by Mr. Gerrard; ZMB, 1. Not mapped.

CHINA, South; 20°–30°N, 100°–120°E; collected 1923–1924 by F. R. Wulsin (letter, 9 Jan. 1925; USNM archives, no. 85377); MCZ, 2. Not mapped.

Chindwin River; *Sagaing*, MYANMAR (= BURMA); 21°35′–27°00′N, 94°20′–97°10′E; collected ca. 1914 by G. C. Shortridge; BNHS, 1 (skull only). Not mapped.

Chin Hills. See Kindat, 20 mi (= 32 km) northwest of.

Chitrakut, Jagvedi and Bara Math Temples; *Uttar Pradesh*, INDIA; 25°12′N, 81°00′E; observed 1959–1960 and 1964–1965 by C. H. Southwick, M. A. Beg, and M. R. Siddiqi (1961a, p. 543; Southwick and M. R. Siddiqi, 1966, p. 312). A:I-85.

Chitral. See Nurestan, eastern.

Chitral, lower. See Kaotai; Kunar River; Mirkhani.

Chittagong, eastern; *Chittagong*, BANGLADESH; ca. 22°20′N, 92°10′E; reported early in 1980 by S. P. Gittins and A. W. Akonda (1982, p. 278). B:Ba-35.

Chittagong, northern; *Chittagong*, BANGLADESH; ca. 22°50′N, 91°40′E; observed early in 1980 by S. P. Gittins and A. W. Akonda (1982, p. 278). Observed before 1982 by M. A. R. Khan (1981, p. 13). B:Ba-33.

Chittagong, southern; *Cox's Bazar*, BANGLADESH; ca. 21°50′N, 92°00′E; observed early in 1980 by S. P. Gittins and A. W. Akonda (1982, p. 278). B:Ba-38.

Chittagong Hill Tracts, BANGLADESH; 21°15′–22°20′N, 92°25′–92°45′E; reported July–Nov. 1976 by K. M. Green (1978, p. 146). Not mapped.

Chittagong Hill Tracts; Chin, MYANMAR (= BURMA); ca. 21°40′N, 92°40′E; collected before 1927 by B. B. Osmaston (Napier, 1981, p. 21); BM(NH), 1 (skull only). B:M-25.

Chittagong Hill Tracts, eastern, BANGLADESH; ca. 22°15′N, 92°30′E; reported early in 1980 by S. P. Gittins and A. W. Akonda (1982, p. 278). B:Ba-36.

Chittagong Hill Tracts, northern, BANGLADESH; ca. 23°20′N, 92°10′E; Observed early in 1980 by S. P. Gittins and A. W. Akonda (1982,

p. 278). Observed before 1982 by M. A. R. Khan (1981, p. 13). B:Ba-34.

Chitwan National Park. See Dudurhani; Simri, Narayani River.

Cho Don District; *Bac Thai*, VIETNAM; ca. 22°10′N, 105°36′E; collected Oct. 1989 by unknown collector; FCXM, 1 (skull only). C:V-6.

Chokoria Sunderbans; *Cox's Bazar*, BANGLADESH; ca. 21°45′N, 92°00′E; reported early in 1980 by S. P. Gittins and A. W. Akonda (1982, p. 278). B:Ba-38.

Chong'an Xian; *Fujian*, CHINA; ca. 27°51′N, 117°48′E; collected 4 May and 18 Aug. 1926 by C. H. Pope (1929, p. 345; 1932c, pp. 491, 495; 1935, pp. 493, 499; 1940, p. 72); AMNH, 2. Reported Aug. 1981 by Zheng Xueqing (1984, p. 145). C:C-76.

Chongyi; *Jiangxi*, CHINA; 25°42′N, 114°19′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-101.

Chongzuo Rare Animal Reserve; *Guangxi*, CHINA; ca. 22°35′N, 107°28′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 129; letter, Aug. 1996). C:C-225.

Chowkichora, Akhnoor Subdistrict; *Jammu & Kashmir*, INDIA; ca. 32°54′N, 74°44′E; observed before 1983 by Y. R. Malhotra and D. N. Sahi (1982, p. 27). A:I-5.

Chuadanga, *Chuadanga*, BANGLADESH; 23°38′N, 88°51′E; reported before 1982 by M. A. R. Khan (1981, p. 13). B:Ba-18.

Chuan Dong, Tian'e Xian; *Guangxi*, CHINA; 25°09′N, 107°05′E; captured 9 Oct. 1992 by Qing Kailon (pers. comm., 16 Oct. 1992); captive observed at Chuan Dong by J. Fooden, 16 Oct. 1992. C:C-173.

Chuandonghe Water Regulation Forest Reserve; *Guangxi*, CHINA; ca. 25°10′N, 107°03′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 128; letter, Aug. 1996). C:C-173.

Chunabati. See Sukna-Kurseong.

Chunar. See Saktesgarh.

Chunati Wildlife Sanctuary; *Chittagong*, BANGLADESH; ca. 21°58′N, 92°04′E; observed Feb. 1990–June 1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, p. 76). B:Ba-38.

Chungan Hsien. See Chong'an Xian.

Chungtia, 4000 ft (= 1200 m); *Nagaland*, INDIA; 26°24′N, 94°28′E; collected ca. Sept. 1919 by J. P. Mills (1923, p. 222); museum unknown, 2 (not seen). B:I-32.

Chunxiu Water Regulation Forest Reserve; *Guangxi*, CHINA; ca. 22°27′N, 106°34′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 129; letter, Aug. 1996). C:C-224.

Chuxiong; *Yunnan*, CHINA; 25°02′N, 101°33′E; tissue sample obtained ca. 1991 by Zhang Yaping and Shi Liming (1993b, p. 589). B:C-52.

Cili; *Hunan*, CHINA; 29°24′N, 111°04′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-109.

Cioupu Shan, Hechi town, Hechi Xian; *Guangxi*, CHINA; 24°42′N, 108°02′E; collected June 1992 by Tan Qin (pers. comm., 13 Oct. 1992); not preserved. C:C-178.

Comilla, BANGLADESH; ca. 23°27′N, 91°12′E; reported before 1982 by M. A. R. Khan (1981, p. 13). B:Ba-29.

Corbett National Park; *Uttar Pradesh*, INDIA; 29°25′–29°35′N, 78°40′–79°05′E; observed Apr. 1954 by E. P. Gee (1975, p. 101). Reported before 1997 by K. K. Gurung and R. Singh (1996, p. 86). Not mapped (see A:I-33).

Cotgai. See Kotgay.

Cox's Bazar, BANGLADESH; 20°48′–21°10′N, 92°05′–92°20′E; observed early in 1980 by S. P. Gittins and A. W. Akonda (1982, p. 278). Not mapped (see B:Ba-38).

Cox's Bazar; *Cox's Bazar*, BANGLADESH; 21°26′N, 91°59′E; observed before 1982 by M. A. R. Khan (1981, p. 13). B:Ba-38.

Cox's Bazar, Forest Division (South); *Cox's Bazar*, BANGLADESH; 20°45′–21°30′N, 92°00′–92°20′E; reported May 1982–Dec. 1983 by S. M. A. Rashid, A. Khan, and M. A. R. Khan (1990, p. 64). Not mapped (see B:Ba-38).

Cox's Bazar, northern, BANGLADESH; ca. 21°35′N, 92°10′E; observed early in 1980 by S. P. Gittins and A. W. Akonda (1982, p. 278). B:Ba-37.

Cuc Phuong; *Ninh Binh*, VIETNAM; 20°19′N, 105°38′E; collected 13 Apr. and 26 Aug. 1963 by unknown collector; ZMVNU, 2 (skulls only, species identification tentative). C:V-23.

Dacca. See Dhaka.

Dachepalle, Piduguralla Taluk, Guntur District; *Andhra Pradesh*, INDIA; 16°36′N, 79°44′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, pp. 17, 19). A:I-130.

Dafla Hills; *Arunachal Pradesh*, INDIA; ca. 27°20′N, 93°30′E; reported Dec. 1972–Feb. 1973 by R. L. Tilson (1983, p. 399). B:I-24.

Dahao Dao; *Xianggang* (= *Hong Kong*), CHINA; ca. 22°15′N, 114°00′E; reported 1908–1921 by R. Mell (1922, p. 10). C:C-210.

Dahe, Xixiang Xian, 800 m; *Shaanxi*, CHINA;

32°37′N, 107°27′E; observed July 1974 by Yao Jianchu, SIZ (pers. comm., 10 Oct. 1985). C:C-35.

Dahongbao Nature Reserve; *Guangxi*, CHINA; 24°52′N, 105°18′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 127; letter, Aug. 1996). C:C-160.

Dainkog (= Dengke); *Sichuan*, CHINA; 32°32′N, 97°55′E; reported before 1998 (Zhang et al., 1997, p. 58). B:C-19.

Daiyun Shan; *Fujian*, CHINA; ca. 25°50′N, 118°15′E; reported Nov. 1983 by Zhen Xueqing (1984, p. 145). C:C-86.

Dak Sut, 700 m; *Kon Tum*, VIETNAM; 14°56′N, 107°44′E; collected 13–16 Jan. 1961 by B. Feinstein (Van Peenen et al., 1969, p. 286; Fooden, 1997, p. 227); USNM, 3. C:V-37.

Dalimkhola. See Gorubathan Forest.

Dalingxia, Gangcun, She Xian, 400–700 m; *Anhui*, CHINA; ca. 30°00′N, 118°10′E; observed 1973–1986 by Xiong Chenpei, K. Wada, and Wang Qishan (Wada et al., 1986, pp. 83, 88). C:C-62.

Dalu. See Taro.

Daming Shan Nature Reserve; *Guangxi*, CHINA; ca. 23°27′N, 108°22′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 126; letter, Aug. 1996). C:C-221.

Damoh. See Kakara.

Danba; *Sichuan*, CHINA; 30°57′N, 101°55′E; collected before 1992 by unknown collector (Jiang Xuelong et al., 1991, p. 243); museum unknown, 4 (not seen). B:C-26.

Dangan Dao (= North Lena Island); *Guangdong*, CHINA; ca. 22°02′N, 114°18′E; observed 5 May 1854 by W. Stimpson (unpublished journal, p. 131; R. Vasile, letters, 2 and 13 May 1987). Collected in 1866 by Commander St. John (in Swinhoe, [1867], p. 556); BM(NH), 1 (holotype of *Inuus sancti-johannis* Swinhoe, [1867]). Reported ca. 1951 by G. A. C. Herklots (1951, p. 83). C:C-211.

Dangan Dao, Zhuhai Xian, 150 m; *Guangdong*, CHINA; 22°02′N, 114°18′E; collected 2 and 25 Mar. 1981 by Liu Zhenhe and Xu Longhuei (Liu Zhenhe, SCIEA, pers. comm., 26 Nov. 1985); SCIEA, 2. C:C-211.

Dangen Island. See Dangan Dao.

Dangori Nadi, near; *Assam*, INDIA; ca. 27°36′N, 95°16′E; observed 6–8 Feb. 1974 by G.Pilleri (1975, p. 20; Pilleri & Pilleri, 1982, p. 158; letter, 15 Dec. 1978); misidentified as *Macaca assamensis*. B:I-26.

Dangs District; *Gujarat*, INDIA; ca. 20°35′–21°00′N, 73°30′–73°55′E; collected 1922–1923 (date discrepancy between original tags and museum tags) by A. C. Miller; BM(NH), 3. Not mapped (see A:I-99).

Dan Sai District; *Loei*, THAILAND; ca. 17°17′N, 101°09′E; collected 31 Mar. 1954 by R. E. Elbel; USNM, 3. B:T-10.

Danzhou, Hainan Dao; *Hainan*, CHINA; 19°43′N, 109°17′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-228.

Daoshiwu, Lin'an Xian; *Zhejiang*, CHINA; ca. 30°18′N, 118°57′E; observed Feb. 1985 by Wu Fuhai, Hangzhou Zoo (pers. comm., 25 Oct. 1985). C:C-55.

Daping Shan Nature Reserve; *Guangxi*, CHINA; ca. 23°33′N, 109°58′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 127; letter, Aug. 1996). C:C-196.

Dareh Nur. See Khyber Pass vicinity.

Darjeeling. See Narbong; Sukna.

Darsi, 100 m; *Andhra Pradesh*, INDIA; 15°46′N, 79°41′E; reported Feb. 1977–July, 1980 by G. U. Kurup (1984, p. 58; 1992, p. 19). Observed 6 May 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 469). A:I-146.

Dashashamedh Ghat. See Varanasi.

Dashuping, 400 m; *Shaanxi*, CHINA; 32°26′N, 107°27′E; observed July 1974 by Yao Jianchu, SIZ (pers. comm., 10 Oct. 1985). C:C-32

Datang, Lunshuihe (river), Tengchong Xian; *Yunnan*, CHINA; ca. 25°30′N, 98°45′E; collected Dec. 1976 by Ma Shilai (pers. comm., 1 Sept. 1983); KIZ, 6. B:C-57.

Dauthara, Aligarh vicinity; *Uttar Pradesh*, INDIA; not precisely located, 27°40′–28°10′N, 77°50′–78°20′E; observed 1959–1975 by C. H. Southwick and M. F. Siddiqi (1977, p. 342). Not mapped.

Dawanglin Water Regulation Forest Reserve; *Guangxi*, CHINA; ca. 23°32′N, 106°20′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 127; letter, Aug. 1996). C:C-168.

Daxin Rare Animal Reserve; *Guangxi*, CHINA; ca. 22°45′N, 107°08′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 129; letter, Aug. 1996). C:C-223.

Dayao Shan Nature Reserve; *Guangxi*, CHINA; ca. 24°02′N, 110°08′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 126; letter, Aug. 1996). C:C-195.

Deep Water Bay. See Sam Shui Wan Valley.

Defu Water Regulation Forest Reserve; *Guangxi*, CHINA; 23°17′N, 105°47′E; observed 1976,

1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 128; letter, Aug. 1996). C:C-164.

Dêgê vicinity; *Sichuan*, CHINA; 31°49′N, 98°40′E; purchased in Dêgê by unknown collector, 15 July 1961; IZCAS, 1 (skin only). B:C-22.

Dehra Dun; *Uttar Pradesh*, INDIA; 30°19′N, 78°02′E; observed June 1965–May 1966 by D. G. Lindburg (1971, p. 5). A:I-27.

Dehra Dun vicinity; *Uttar Pradesh*, INDIA; ca. 30°19′N, 78°02′E; observed Sept. 1959–Feb. 1960 by C. H. Southwick, M. A. Beg, and M. R. Siddiqi (1961a, p. 540). Observed 1975–1980 by P. K. Seth, S. Seth, and A. Shukla (1983, p. 38; Seth and Seth, 1983, p. 63). Observed 1981–1983 by P. K. Seth, S. Seth, G. L. Reddy, and P. K. Chopra (1992, p. 62). Trapped for psychological study before 1993 by K. Waheeda (1992, p. 111). A:I-27.

Dehra Dun vicinity, 600 m; *Uttar Pradesh*, INDIA; ca. 30°19′N, 78°02′E; observed Aug. 1955 by M. L. Roonwal (1956, p. 171). A:I-27.

Dela, ca. 8 mi (= 13 km) west of Ramnagar, Kumaun region, 1500 ft (= 460 m); *Uttar Pradesh*, INDIA; 29°26′N, 79°00′E; collected 7 Jan. 1914 by C. A. Crump (in Wroughton, 1914, p. 284; Napier, 1981, p. 24); BM(NH), 1 (skin only). A:I-33.

Delhi; *Delhi*, INDIA; 28°40′N, 77°13′E; observed Sept. 1959–Feb. 1960 by C. H. Southwick, M. A. Beg, and M. R. Siddiqi (1961a, p. 543). Observed 1964–1965 by R. P. Mukherjee and G. D. Mukherjee (1972, p. 67). A:I-41.

Delhi-Agra, highway between; *Haryana*, INDIA; ca. 28°00′N, 77°20′E; observed Sept. 1961 by I. Krumbiegel (1965, p. 32). Observed 1964–1965 by R. P. Mukherjee and G. D. Mukherjee (1972, p. 67). A:I-43.

Delhi-Aligarh, highway between; *Uttar Pradesh*, INDIA; ca. 28°20′N, 77°50′E; observed 2–5 Jan. 1965 by C. H. Southwick, D. Lindburg, M. R. Siddiqi, R. P. Mukherjee, and B. Singh (Southwick & M. R. Siddiqi, 1966, p. 306). A:I-46.

Delhi-Hathras, highway between; *Uttar Pradesh*, INDIA; ca. 28°10′N, 77°40′E; observed Sept. 1959–June 1960 by C. H. Southwick, M. A. Beg, and M. R. Siddiqi (1961b, p. 702). A:I-45.

Delhi-Kanpur, highway between; *Uttar Pradesh*, INDIA; ca. 27°30′N, 78°45′E; observed 1964–1965 by R. P. Mukherjee and G. D. Mukherjee (1972, p. 67). A:I-68.

Delhi-Mathura, highway between; *Delhi*, INDIA; ca. 28°40′N, 77°13′E; observed Dec. 1970–July 1972 by C. H. Southwick, M. F. Siddiqi, M. Y. Farooqui, and B. C. Pal (1976, p. 13). A:I-41.

Delhi vicinity; *Delhi*, INDIA; ca. 28°40′N, 77°13′E; autopsied ca. 1966 by K. K. Chawla, C. D. S. Murthy, R. N. Chakravarti, and P. N. Chhuttani (1967, p. 85). Observed 1981–1983 by P. K. Seth, S. Seth, G. L. Reddy, and P. K. Chopra (1992, p. 62). A:I-41.

Dengke. See Dainkog.

Dening, Mishmi Hills, 2240–2250 ft (= 685 m); *Arunachal Pradesh*, INDIA; 28°01′N, 96°14′E; collected 29 Mar. and 6 Apr. 1921 by H. W. Wells (Hinton & Lindsay, 1926, p. 385); BM(NH), 3 (including 1 skin only). B:I-28.

Deogarh, Sambalpur District; *Orissa*, INDIA; 21°32′N, 84°44′E; collected 30 Dec. 1972 by A. K. Mandal; ZSI, 1 (skin only). A:I-104.

Dêqên; Yunnan, CHINA; 28°30′N, 98°52′E; reported before 1998 (Zhang et al., 1997, p. 58). B:C-36.

Dhaka; *Dhaka*, BANGLADESH; 23°43′N, 90°25′E; observed 1975–1977 by J. R. Oppenheimer, A. W. Akonda, and K. Z. Husain (1983, p. 194). Observed July–Nov. 1976 by K. M. Green (1978, p. 154). Reported before 1982 by M. A. R. Khan (1981, p. 13; 1985, p. 31). Observed Feb. 1990–June 1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, p. 76). B:Ba-27.

Dhalar. See Narkanda, ca. 1 km north of.

Dhaleswari River. See Nagorhgena.

Dhamrai (= Dhamrei); *Dhaka*, BANGLADESH; 23°55′N, 90°13′E; observed Jan. 1976 by J. R. Oppenheimer, A. K. Akonda, and K. Z. Husain (1983, p. 194). Observed July–Nov. 1976 by K. M. Green (1978, p. 154). Reported before 1982 by M. A. R. Khan (1981, p. 13; 1985, p. 31). Observed Feb. 1990–June 1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, p. 76). B:Ba-16.

Dhangarhi; *Kailali*, NEPAL; 28°34′N, 80°36′E; observed June 1964–Dec. 1965 by D. L. Chesemore (1970, p. 164). A:N-4.

Dharmajigudem (= Dharmajidudem), Chintalapudi Taluk, West Godavari District; *Andhra Pradesh*, INDIA; 16°53′N, 81°00′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 19). A:I-139.

Dharmsala, 4500 ft (= 1370 m); *Himachal Pradesh*, INDIA; 32°13′N, 76°19′E; collected 5 Feb. 1922 by H. W. Wells (Lindsay, 1926, p. 599); BM(NH), 1. A:I-12.

Dhaulkot Forest, Dehra Dun region; *Uttar Pra-*

desh, INDIA; ca. 30°25′N, 77°55′E; observed Oct.–Dec. 1977 by S. C. Makwana (1979a, p. 242). A:I-27.

Dhela. See Dela.

Dhikala. See Ramganga River.

Dhulkot. See Dhaulkot Forest.

Dhuniopathar; *Assam*, INDIA; ca. 27°07′N, 95°10′E; reported 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 31). B:I-30.

Dibru-Saikhowa Wildlife Sanctuary; *Assam*, INDIA; 27°35′–27°47′N, 95°10′–95°40′E; observed 1992–1996 by A. Choudhury (1998, pp. 194, 197). Not mapped (see B:I-26).

Dichialgaon; *Assam*, INDIA; ca. 26°58′N, 94°31′E; reported 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 31). B:I-25.

Diggi Road. See Aligarh.

Dihajan habi; *Assam*, INDIA; 27°08′N, 94°46′E; observed 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 32). B:I-25.

Dillighat; *Assam*, INDIA; ca. 27°10′N, 95°17′E; reported 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 31). B:I-30.

Dimapur. See Imphal, ca. 4 mi (= 6.5 km) north of.

Dinajpur District; *Dinajpur*, BANGLADESH; ca. 25°50′N, 88°35′E; reported before 1982 by M. A. R. Khan (1981, p. 13; 1985, p. 31). B:Ba-1.

Dinh Ca, Thai Nguyen region, 300 m; *Bac Thai*, VIETNAM; 21°45′N, 106°03′E; collected 20 Dec. 1956 by unknown collector (Dao, 1961, p. 302; 1985, p. 64); museum unknown, 1 (skull only; cranial measurements cited by Dao). C:V-11.

Dir District. See Dokdusra; Gwaldri Valley; Landrai Valley.

Diroi (Rangoli) Reserve Forest; *Assam*, INDIA; ca. 27°08′N, 95°01′E; observed 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 32). B:I-30.

Ditin, Jingxi Xian; *Guangxi*, CHINA; ca. 23°10′N, 106°30′E; collected Nov. 1982 by Wei Zhanyi; FDCG, 1 (Skull only). C:C-167.

Dizhou Water Regulation Forest Reserve; *Guangxi*, CHINA; ca. 23°02′N, 106°13′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 128; letter, Aug. 1996). C:C-166.

Dokdusra, northern Dir District; *North-West Frontier*, PAKISTAN; 35°32′N, 72°13′E; reported before 1978 by T. J. Roberts (1977, p. 86). A:P-2.

Dommeru, West Godavari District, 40 m; *Andhra Pradesh*, INDIA; 17°02′N, 81°41′E; observed 17 May 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 467). A:I-138.

Dongfang, Hainan Dao; *Hainan*, CHINA; ca. 19°04′N, 108°51′E; collected 7 Feb. 1957 by Tang Ziying; FUBD, 2 (1 skin only, 1 skull only). Collected 9 May 1957 by Wang Sung; IZCAS, 1. C:C-235.

Dong He. See Wa Shan.

Dongmen, Xianan Subcounty, Huanjiang Xian, 460 m; *Guangxi*, CHINA; ca. 25°09′N, 107°53′E; collected 21 Oct. 1992 by Tan Nenrui (pers. comm. 5 Nov. 1992); IZCAS, 1 (skin only). C:C-177.

Dongshan, 5 km south of Xianan, Huanjiang Xian, 440 m; *Guangxi*, CHINA; ca. 24°52′N, 107°57′E; captured ca. 15 Oct. 1992 by Gung Lao (pers. comm., 5 Nov. 1992); captive observed 5 Nov. 1992 at Xianan. C:C-177.

Dowoka, above 9500 ft (>2900 m); *Xizang* (= *Tibet*), CHINA; ca. 29°22′N, 94°18′E; reported July–Aug. 1913 by F. M. Bailey (1914, map; 1915, p. 74). B:C-9.

Doza. See Narkanda, ca. 1 km north of.

Dudhwa National Park; *Uttar Pradesh*, INDIA; ca. 28°25′N, 80°45′E; reported before 1997 by K. K. Gurung and R. Singh (1996, p. 90). A:I-supplementary.

Dudurhani, Narayani River, Rapti Valley; *Chitawan*, NEPAL; 27°34′N, 84°14′E; observed June 1964–Dec. 1965 by D. L. Chesemore (1970, p. 164). Reported at Chitwan National Park before 1997 by K. K. Gurung and R. Singh (1996, p. 84). A:N-8.

Dumel, Udhampur Subdistrict; *Jammu & Kashmir* INDIA; ca. 32°56′N, 75°08′E; observed before 1983 by Y. R. Malhotra and D. N. Sahi (1982, p. 27). A:I-10.

Dumpallagudem, Mulug Taluk, Warangal District; *Andhra Pradesh*, INDIA; 18°09′N, 80°09′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18). A:I-120.

Dunga Gali vicinity, Hazara District; *North-West Frontier*, PAKISTAN; ca. 34°03′N, 73°22′E; reported summer 1968 by T. J. Roberts (1977, p. 87). Blood samples collected 1978–1979 by D. J. Melnick, C. J. Jolly, and K. K. Kidd (1984, p. 342). Observed 15 Mar. 1980–15 Dec. 1981 by A. Rab, S. S. Sahibzada, and M. Afzal (1991, p. 219). A:P-12.

Dunga Gali vicinity, Hazara District, 2000–2800 m; *North-West Frontier*, PAKISTAN; 34°03′N, 73°22′E; collected 12 Sept. 1963 at 8100 ft (= 2470 m) by R. L. Amouraux; USNM, 1. Observed 1978–1981 at 2000–2800 m by S. J.

Goldstein and A. F. Richard (1989, p. 532). Observed 1979–1980 at 8200 ft (= 2500 m) by S. S. Sahibzada, Q. A. Iqbal, and A. Rab (1985, p. 198). A:P-12.

Dunwein, Kishtwar District, 7600–7800 ft (= 2320–2380 m); *Jammu & Kashmir*, INDIA; 33°20′N, 75°49′E; collected 21 Nov. 1897 by P. H. G. Powell-Cotton (Napier, 1981, p. 25); PCM, 2 (including 1 mounted skin with skull inside). A:I-11.

Dupleix Mountains, south of; *Xizang*, CHINA; ca. 33°38′N, 89°43′E; improbable record (Bonvalot, 1891, vol. 1, p. 210; 1892, p. 218; See "Geographic Distribution and Current Population Estimates" above). Not mapped.

Durga Temple. See Varanasi.

Dushan; Guizhou CHINA; 25°50′N, 107°32′E; tissue samples obtained ca. 1991 by Zhang Yaping and Shi Liming (1993b, p. 589). C:C-123.

Dzo La, southeast of; *Xizang* (= *Tibet*), CHINA; ca. 29°13′N, 97°07′E; observed 12–24 July 1935 by R. Kaulback (1938, p. 91). B:C-33.

Eagle's Nest Trail, Kowloon Reservoir Area; *Xianggang* (= *Hong Kong*), CHINA; ca. 22°21′N, 114°09′E; population probably artificially introduced (Herklots, 1951, p. 83). Observed July–Aug. 1980 and July–Aug. 1981 by C. H. Southwick and K. L. Southwick (1983, p. 19). Observed 1984–1988 by F. D. Burton and L. Chan (1996, p. 396). Observed 10 Jan.–3 Feb. 1987 by C. H. Southwick and D. Manry (1987, p. 48). C:C=210.

East BURMA. See MYANMAR (= BURMA), eastern.

Eastern Mausleum. See Xinglong Xian, southern.

Eastern Mausoleum. See Xinglong Xian, southern.

Eastern Tombs. See Xinglong Xian, southern.

East *Sichuan*. See *Sichuan*, eastern.

Emei Shan (= Mount Omei); *Sichuan*, CHINA; ca. 29°32′N, 103°21′E; collected before 1930 by unknown collector (Howell, 1929, p. 35); USNM, 1 (specimen not located). Reported before 1942 by A. de C. Sowerby (1941, p. 261). C:C-139.

Enshi; *Hubei*, CHINA; 30°18′N, 109°29′E; tissue sample obtained ca. 1991 by Zhang Yaping and Shi Liming (1993b, p. 589). C:C-39.

Erzhou Dao; *Guangdong*, CHINA; ca. 22°00′N, 114°11′E; reported in 1981 by Liu Zhenhe and Yuan Xicai (Zhang et al., 1991, p. 177; 1997, p. 58). Population possibly artificially introduced >100 years ago (Zhang Yongzu, letter, 3 July 1996). C:C-211.

Faizabad vicinity; *Uttar Pradesh*, INDIA; ca. 26°47′N, 82°08′E; blood samples collected 16–27 Apr. 1964 by K. V. Shah and C. H. Southwick (1965, p. 489). A:I-60.

Faizabad-Ajodhya, highway between; *Uttar Pradesh*, INDIA; ca. 26°45′N, 82°10′E; observed Sept. 1959–June 1960 by C. H. Southwick, M. A. Beg, and M. R. Siddiqi (1961b, p. 702). A:I-60.

Fameng, Xingyi Xian, 1580 m; *Guizhou*, CHINA; ca. 24°45′N, 104°45′E; collected 11 July 1963 by Wang Yingxiang (pers. comm., 1 Sept. 1983); KIZ, 1 (skull only). C:C-155.

Fangdao Nature Reserve, Jian'ou Xian; *Fujian*, CHINA; 27°01′N, 118°08′E; observed July 1985 by Tang Ziying, FUBD (pers. comm., 19 Oct. 1985). C:C-72.

Fanjingshan; *Guizhou*, CHINA; 27°57′N, 108°50′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-116.

Faridpur, BANGLADESH; ca. 23°15′N, 90°00′E; reported before 1982 by M. A. R. Khan (1981, p. 13). B:Ba-26.

Fechugang; *Sylhet*, BANGLADESH; 24°42′N, 91°57′E; observed Feb. 1990–June 1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, p. 76). B:Ba-12.

Fengxingshan, Jing'an Xian; *Jiangxi*, CHINA ca. 8°52′N, 115°22′E; trapped and released May 1984 (Tan, 1985, p. 73). C:C-77.

Fokien Occid. See Kuatun.

Forest Research Institute. See Dehra Dun.

Fugong; *Yunnan*, CHINA; 26°58′N, 98°54′E; reported before 1998 (Zhang et al., 1997, p. 58). B:C-42.

Fuhai. See Menghai.

Fujian, CHINA; 24°–28°N, 116°–120°E; collected before 1986 by unknown collector; SCIEA, 1 (skin only). Tissue samples obtained ca. 1991 by Zhang Yaping and Shi Liming (1993b, p. 589). Not mapped.

Funing; *Yunnan*, CHINA; 23°37′N, 105°36′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-163.

Fuqing vicinity; *Fujian*, CHINA; ca. 25°43′N, 119°22′E; purchased Aug. 1963 by unknown collector; IZCAS, 2. C:C-85.

Fusui Rare Animal Reserve; *Guangxi*, CHINA; ca. 22°30′N, 107°32′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 129; letter, Aug. 1996). C:C-225.

Fuxi, She Xian, 400–700 m; *Anhui*, CHINA; ca.

30°05′N, 118°15′E; observed 1973–1986 by Xiong Chenpei, K. Wada, and Wang Qishan (Wada et al., 1986, pp. 83, 88, 91). C:C-62.

Fuyuan; *Yunnan*, CHINA; 25°40′N, 104°14′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-147.

Galta, ca. 10 km from Jaipur; *Rajasthan*, INDIA; ca. 26°53′N, 75°52′E; observed Mar. 1956–Oct. 1960 by I. Prakash (1958, p. 154; 1962, p. 83). Observed 1975–1980 by P. K. Seth and S. Seth (1983, p. 63). Observed Nov. 1979–Oct. 1980 by R. Singh (1986, p. 607; 1989, p. 139; 1992, p. 192). Observed ca. 1982–1988 by L. D. Wolfe and R. Mathur (1988, p. 535; Mathur, 1982, p. 12; Wolfe, 1992, p. 45). Observed before 1993 by N. K. Chandel (1992, p. 121). A: I-75.

Gam, Song, Left bank; *Tuyen Quang*, VIETNAM; ca. 22°25′N, 105°22′E; reported Feb.–Apr. 1992 by R. Ratajszczak, Ngoc Can, and Pham Nhat (1992, p. 17). C:V-6.

Gange. See Ganges River.

Ganges River, forests along banks ("forêts des bords du Gange"); *Bihar*, *Uttar Pradesh*, or *West Bengal*, INDIA; 23°–31°N, 78°–88°E; reported before 1820 by F. Cuvier (1819, p. 2). Not mapped.

Gangupahad (= Ganukapahad), Jangaon Taluk, Warangal District; *Andhra Pradesh*, INDIA; 17°47′N, 79°08′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18). A:I-122.

Gao Lo Shan; *Guangxi*, CHINA; ca. 24°10′N, 106°47′E; captured Nov.–Dec. 1990 by Liu Jinhwei (pers. comm., 15 Oct. 1992); captive observed at Tian'e, 15 Oct. 1992. C:C-172.

Garampani. See Hot Springs.

Garidhwa. See Simulbari-Pankhabari.

Garo Hills; *Meghalaya* INDIA ca. 25°30′N, 90°30′E; reported Dec. 1972–Feb. 1973 by R. L. Tilson (1983, p. 399). B:I-13.

Garo Hills, foot; *Sherpur*, BANGLADESH; ca. 25°00′N, 90°00′E; observed before 1982 by M. A. R. Khan (1981, p. 13). B:Ba-6.

Garubathan. See Gorubathan Forest.

Gaushalla, 1330 m; *Katmandu Valley*, NEPAL; 27°42′N, 85°21′E; observed 1977–1982 by B. M. Marriott (1988, p. 126). Observed summer 1983 by R. L. Johnson and C. H. Southwick (1984, p. 201). A:N-12.

Gegong, Dongzhi Xian, 400–600 m; *Anhui*, CHINA; 30°05′N, 117°11′E; observed 1973–1986 by Xiong Chenpei (Wada et al., 1986, p. 83). C:C-49.

Gejiu; *Yunnan*, CHINA; 23°23′N, 103°09′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-149.

Gengma; *Yunnan*, CHINA; ca, 23°31′N, 99°24′E; collected 18–20 May 1964 by Quan Guoqiang (pers. comm., 25 Aug. 1983; Yen Wenchen, 1973, p. 356); IZCAS, 3. B:C-67.

Getou, Leishan Xian, 1200 m; *Guizhou*, CHINA; ca. 26°20′N, 108°10′E; collected 4 Sept. 1963 by unknown collector; KIZ, 3. C:C-121.

Gharmur (= Gharmura), ca. 1 km south of ; *Assam*, INDIA; ca. 24°17′N, 92°31′E; observed 21–25 Mar. 1986 and 1987–1988 by A. Choudhury (1983, p. 14; 1989, p. 491; [1991b], p. 124; 1994, p. 207). B:I-39.

Ghaziabad District; *Uttar Pradesh*, INDIA; ca. 28°40′N, 77°26′E; observed 1981–1983 by P. K. Seth, S. Seth, G. L. Reddy, and P. K. Chopra (1992, p. 62). A:I-41.

Ghazipur; *Comilla*, BANGLADESH; 23°32′N, 91°08′E; introduced population, reported before 1986 by M. A. R. Khan (1985, p. 31). Not mapped.

GhodaGhodi Tal; *Kailali*, NEPAL; 28°41′N, 80°57′E; observed in 1998 by M. K. Chalise and M. Ghimire (1998, p. 12). A:N-supplementary.

Ghora Dhaka, 1 mi (= 1.6 km) east of, Hazara District; *North-West Frontier*, PAKISTAN; 34°02′N, 73°26′E; collected 18 Sept. 1962 by H. W. Setzer; USNM, 1. A:P-12.

Ghori Hill, Dangs District, 325 m; *Gujarat*, INDIA; 20°51′N, 73°33′E; observed 8 Jan. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 466). A:I-99.

Gin Keo Ho (= Giakeoho), cliff above; *Sichuan*, CHINA; 29°20′N, 103°05′E; collected 18 July 1925 by D. G. Graham (1926–29, p. 31; unpublished map, USNM, archives, no. 89413); USNM, 1. C:C-140.

Gokarna, King's Forest, 5 mi (= 8 km) northeast of Katmandu, 4500 ft (= 1370 m); *Bagmati*, NEPAL; ca. 27°43′N, 85°23′E; collected 24 Dec. 1966 by C. O. Maser; FMNH, 1; UPS, 1 (skin only). A:N-12.

Gokavaram, Krishna District, 1 m; *Andhra Pradesh*, INDIA; 16°16′N, 81°13′E; observed 15 May 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 468). A:I-141.

Gokteik. See Pyaunggaung.

Golaghat, Sibsagar District, 300 ft (= 90 m); *Assam*, INDIA; 26°31′N, 93°58′E; collected 4 Jan. 1920 by H. W. Wells (Hinton & Lindsay, 1926, p. 385); BM(NH), 1. B:I-22.

Golog Zangzu Zizhizhou (prefecture); *Qinghai*, CHINA; 32°30′–35°30′N, 96°50′–102°30′; reported 1959–1961 by Chang Chieh and Wang Tsung-yi (1963, p. 126). Not mapped.

Gonda vicinity; *Uttar Pradesh*, INDIA; ca. 27°08′N, 81°56′E; blood samples collected 16–27 Apr. 1964 by K. V. Shah and C. H. Southwick (1965, p. 489). A:I-59.

Gongbo'gyamda Xian; *Xizang* (= *Tibet*), CHINA; ca. 29°55′N, 93°15′E; observed 1979–1982 by Zhang Cizu, Director, Shanghai Zoo (pers. comm., 18 Oct. 1985). B:C-8.

Gorkha. See Chengli.

Gorubathan Forest; *West Bengal*, INDIA; ca. 26°58′N, 88°42′E; observed Mar.–Apr. 1985 by R. P. Mukherjee, S. Chaudhuri, and A. Murmu (1995, p. 27). A:I-8.

Government Press. See Aligarh.

Govindaraopeta, Mulug Taluk, Warangal District; *Andhra Pradesh*, INDIA; 18°11′N, 80°08′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18). A:I-120.

Guangdong, CHINA; 20°–26°N, 110°–117°E; captive purchased in Shanghai 1923–1924 by F. R. Wulsin (letter, 9 Jan. 1925; USNM archives, no. 85377); MCZ, 1. Not mapped.

Guangdong or *Guangxi*, CHINA; 20°–27°N, 104°–117°E; collected 1923–1924 by F. R. Wulsin (letter, 9 Jan. 1925; USNM archives, no. 85377); MCZ, 1. Not mapped.

Guangli, 50 m above, Hongshui He, right bank, Tian'e Xian, 260 m; *Guangxi*, CHINA; 25°12′N, 106°56′E; observed 30 Oct. 1992 by J. Fooden (cf. Fooden et al., 1994, p. 623). C:C-173.

Guangnan; *Yunnan*, CHINA; 24°03′N, 105°03′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-153.

Guangxi, CHINA; 21°–27°N, 104°–112°E; purchased in Shanghai Nov. 1922 by F. R. Wulsin; USNM, 4 (including 1 skin only). Collected 1951–1980 by museum collectors; SMNH, 22 (including 16 skins only, 2 skulls only). Not mapped.

Guangze Xian; *Fujian*, CHINA; ca. 27°30′N, 117°24′E; reported Sept. 1981 by Zheng Xueqing (1984, p. 145). C:C-79.

Guanxian; *Sichuan*, CHINA; 31°00′N, 103°37′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-30.

Gudari; *Orissa*, INDIA; 19°21′N, 83°47′E; collected 10 Sept. 1927 by A. V. Sundaram and A. H. Bishop; BM(NH), 1 (skin only). A:I-108.

Guidong; *Hunan*, CHINA; 26°12′N, 114°00′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-102.

Guixi; *Guangxi*, China ca. 21°50′N, 109°40′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-216.

Guiyang; *Guizhou*, CHINA; 26°35′N, 106°43′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-125.

Guizhou, CHINA; 25°–29°N, 104°–109°E; collected Jan. 1962 by unknown collectors; KIZ, 2. Immunological survey conducted before 1996 by Duan Xiangsheng, Liu Yuanwei, Wu Jing, Dao Weiying, and Liu Jianghai (1995, p. 411). Not mapped.

Gulin; *Sichuan*, CHINA; 28°07′N, 105°51′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-131.

Gulong Shan Water Regulation Forest Reserve; *Guangxi*, CHINA; ca. 23°05′N, 106°40′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 128; letter, Aug. 1996). C:C-167.

Gumti Sanctuary; *Tripura*, INDIA; ca. 23°30′N, 91°40′E; reported before 1990 by Ranjitsinh (1990, p. 435; Gupta, 1994, p. 102). B:I-40.

Gundi, Asifabad Taluk, Adilabad District; *Andhra Pradesh*, INDIA; 19°22′N, 79°20′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18). A:I-113.

Guniujiang, Shitai-Qimen Xian; <700 m; *Anhui*, CHINA; ca. 30°05′N, 117°30′E; observed 1973–1986 by Xiong Chenpei (Wada et al., 1986, p. 83). C:C-48.

Guolo Prefecture. See Golog Zangzu Zizhizhou.

Gupo Shan Water Regulation Forest Reserve; *Guangxi*, CHINA; ca. 24°39′N, 111°33′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 128; letter, Aug. 1996). C:C-199.

Gurjal, Asifabad Taluk, Adilabad District; *Andhra Pradesh*, INDIA; 19°02′N, 79°30′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18), A:-112.

Gurkha. See Chengli.

Gusalek, north of; *Konarha*, AFGHANISTAN; ca. 35°05′N, 70°40′E; reported before 1972 by A. Puget (1971, p. 201). A:A-3.

Gwaldri Valley, northern Dir District; *North-West Frontier*, PAKISTAN; ca. 35°25′N, 72°04′E; reported before 1978 by T. J. Roberts (1977, p. 86). A:N-2.

Gyaca Xian; *Xizang* (= *Tibet*), CHINA; ca. 29°25′N, 92°40′E; observed 1979–1982 by

Zhang Cizu, Director, Shanghai Zoo (pers. comm., 18 Oct. 1985). B:C-7.

Gyala, above, 2800 m; *Xizang* (= *Tibet*), CHINA; ca. 29°38′N, 94°56′E; observed 17 July 1913 by F. M. Bailey (1914, map; 1915, p. 74; 1957, p. 122). B:C-12.

Gyirong Subcounty; *Xizang* (= *Tibet*), CHINA; ca. 28°30′N, 85°15′E; Observed summer 1945 by H. Harrer (1982, p. 85). Observed in 1982 by Zhang Cizu, Shanghai Zoo (Zhang et al., 1991, p. 177; letter, 3 July 1996). A:C-1.

Hadya, Surat District, 250 m; *Gujarat*, INDIA; 21°05′N, 73°38′E; observed 24 Jan. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 466). A:I-99.

Hainan Dao; *Hainan*, CHINA; 18°–20°N, 109°–111°E; reported before 1736 by J. B. du Halde (1735, p. 233). Purchased 20 Dec. 1919 in Guangzhou by R. Mell (1922, p. 11); ZMB, 1 (skin only). Tissue samples obtained ca. 1991 by Zhang Yaping and Shi Liming (1993b, p. 589). Not mapped.

Haiyang Shan Water Regulation Forest Reserve *Guangxi*, CHINA; ca. 25°14′N, 110°42′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 127; letter, Aug. 1996). C:C-192.

Haldhibari Block, Kaziranga Wild life Sancturary, 75 m; *Assam*, INDIA; ca. 26°37′N, 93°22′E; observed 24–25 Mar. 1972 by P. Lahan and R. N. Sonowal (1974, pp. 261, 278; Spillett, 1967, p. 503). B:I-21.

Haldwani; *Uttar Pradesh*, INDIA; 29°13′N, 79°31′E; observed Jan.– Dec. 1965 by M. K. Neville (1968b, p. 114). A:I-32.

Haldwani vicinity, bhabar forest, subtropical pine belt, and tropical moist deciduous forest; *Uttar Pradesh*, INDIA; ca. 29°13′N, 79°31′E; observed Jan.–Dec. 1965 by M. K. Neville (1968b, p. 114). A:I-32.

Halwapura, 5 mi (= 8 km) from Kaukori; *Uttar Pradesh*, INDIA; ca. 26°54′N, 80°48′E; observed Feb. 1963 by P. Jay (1965, pp. 200, 249). A:I-66.

Hanmajipet (= Hanumajipet), Banswada Taluk, Nizamabad District *Andhra Pradesh*, INDIA; 18°25′N, 78°00′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18). A:I-117.

Hanumangarhi Hill, near, Naini Tal District, 2000 m; *Uttar Pradesh*, INDIA; ca. 29°23′N, 79°27′E; observed Sept. 1978 by S. M. Das and B. D. Sharma (1981, p. 496). A:I-32.

Hanuman Junction, Krishna District, 20 m; *Andhra Pradesh*, INDIA; 16°38′N, 80°58′E; observed 16 May 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 468). A:I-140.

Harargaj; *Moulvi Bazar*, BANGLADESH; ca. 24°25′N, 92°00′E; observed early in 1980 by S. P. Gittins and A. W. Akonda (1982, p. 278). B: Ba-13.

Harbhajwala. See Dehra Dun vicintiy.

Harchandi Sahai, southwest of Puri; *Orissa*, INDIA; ca. 19°48′N, 85°50′E; observed 15–17 Feb. 1980 by R. P. Mukherjee (1984, p. 260). A:I-106.

Harduaganj; *Uttar Pradesh*, INDIA; ca. 27°56′N, 78°10′E; observed 1959–1975 by C. H. Southwick and M. F. Siddiqi (1977, p. 342). A:I-69.

Hardwar; *Uttar Pradesh*, INDIA; 29°58′N, 78°10′E; observed Sept. 1959–Feb. 1960 and 1964–1965 by C. H. Southwick, M. A. Beg, and M. R. Siddiqi (1961a, p. 543; Southwick and M. R. Siddiqi, 1966, p. 309). A:I-27.

Harinbhanga; *West Bengal*, INDIA; ca. 21°45′N, 89°00′E; observed 1955–1960 by A. K. Mukherjee (Mukherjee & Gupta, 1965, p. 145). B: I-1.

Haripur, Kheri District; *Uttar Pradesh*, INDIA; ca. 28°07′N, 80°43′E; collected Mar. 1932 by C. McCann; BNHS, 1 (skin only). A:I-55.

Harnarayan Mohalla. See Khair, Tahsil.

Hasimara, Bhutan Duars, 550 ft (= 170 m); *West Bengal*, INDIA; ca. 26°45′N, 89°20′E; collected 1–10 Jan. 1916 by N. A. Baptista (H. V. O'Donel in Wroughton, 1917, p. 63); BM(NH), 3; BNHS, mounted skin, on exhibit. A:I-9.

Hastings Road. See Calcutta.

Hathras; *Uttar Pradesh*, INDIA; 27°36′N, 78°03′E; observed Sept. 1959–Feb. 1960 by C. H. Southwick, M. A. Beg, and M. R. Siddiqi (1961a, p. 543). A:I-69.

Hatighuli; *Assam*, INDIA; ca. 26°56′N, 94°31′E; reported 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 31). B:I-25.

Hazara District, southern; *North-West Frontier*, PAKISTAN; ca. 34°00′N, 73°00′E; observed 1914–1916 by R. W. G. Hingston ([1920], p. 243). A:P-8.

Hazaria Patherghatta, 600 ft (= 180 m); *Narayani*, NEPAL; ca. 27°00′N, 85°15′E; collected 17 Feb. 1921 by N. A. Baptista (Hinton & Fry, 1923, p. 402); BM(NH), 1 (topotype of *Cercopithecus* (*Mulatta*) Zimmerman, 1780; see Pocock, 1932, p. 533). A:N-13.

Hazarikhil; *Chittagong*, BANGLADESH; ca. 22°20′N, 92°00′E; observed Feb. 1990–June

1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, p. 76). B:Ba-35.

Hechi Prefecture; *Guangxi*, CHINA; ca. 24°42′N, 108°02′E; acquired in 1992 from Chinese Medicine Division, Hechi; IZCAS, 3 (skulls only). B: C-178

Heinsun (= Heinsum; Heinzun), east bank of Chindwin River; *Sagaing*, MYANMAR (= BURMA); 25°52′N, 95°35′E; collected 11 Mar. 1935 by H. C. Raven (in Carter, 1943, p. 100; Morris, 1936, p. 665); AMNH, 2. B:M-9.

Hejiang; *Sichuan*, CHINA; 28°50′N, 105°46′E; reported before 1992 by Jiang Xuelong, Wang Yingxiang, and Ma Shilai (1991, p. 244). C:C-136.

Hekou; *Yunnan*, CHINA; 22°36′N, 103°58′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-152.

Heluwabeshi; *Dhankuta*, NEPAL; 27°26′N, 87°08′E; observed in 1998 by M. K. Chalise and M. Ghimire (1998, p. 12). B:N-supplementary.

Henron; Hainan Dao; *Hainan*, CHINA; not precisely located, 18–20°N, 109–111°E; collected 10 May 1904 by A. Owston (Allen, 1906, pp. 465, 488); AMNH, 1. Not mapped.

Himchari; *Cox's Bazar*, BANGLADESH; ca. 21°45′N, 92°00′E; observed Feb. 1990–June 1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, p. 76). B:Ba-38.

Hindan Bridge Temple. See Delhi.

Hissar District; *Haryana*, INDIA; ca. 29°26′N, 75°18′E; observed 1981–1983 by P. K. Seth, S. Seth, G. L. Reddy, and P. K. Chopra (1992, p. 62). A:I-39.

Hisweht (= Hiswet), west bank of Nantaleik Chaung, above Tamanthi, upper Chindwin River, 460 ft (= 140 m); *Sagaing*, MYANMAR (= BURMA); ca. 25°22′N, 95°16′E; collected 25 Aug. 1914 by G. C. Shortridge and S. A. Macmillan (Shortridge in Wroughton, 1916a, p. 293); BM(NH), 1. B:M-12.

Hitaura, 0.5 mi (= 1 km) west, 1450 m; *Chisapani*, NEPAL; 27°27′N, 85°02′E; recorded 12 Feb. 1967 by C. O. Maser (field notebook, FMNH, p. 39); specimen not located. A:N-10.

Hkamti. See Singkaling Hkamti.

Hkandau, 2000 ft (= 610 m); *Kachin*, MYANMAR (= BURMA); 26°01′N, 97°50′E; collected 8 Aug. 1939 by R. Kaulback; BM(NH), 1 (skin only). B:M-2.

Hoa Binh; *Hoa Binh*, VIETNAM; ca. 20°49′N, 105°22′E; collected 1 June 1972 by Dang Huy Huynh and Truong Van Le; IEBR, 1. C:V-20.

Hoa Binh, VIETNAM; 20°20′–21°00′N, 104°50′–105°50′E; collected 19 July 1960 by unknown collector; ZMVNU, 1 (skin only). Not mapped.

Hoi Xuan, Quan Hoa District; *Thanh Hoa*, VIETNAM; 20°23′N, 105°06′E; collected Mar. 1964 by unknown collector (Dao, 1985, p. 196); museum unknown (not seen), 2. C:V-22.

Homalin, west bank of upper Chindwin River, 400 ft (= 120 m); *Sagaing*, MYANMAR (= BURMA); 24°52′N, 94°55′E; collected 14–15 July 1914 by G. C. Shortridge and S. A. Macmillan (Shortridge in Wroughton, 1916a, p. 293); BM(NH), 2: BNHS, 1. B:M-14.

Hong Kong. See *Xianggang*.

Hongshui He, between Tian'e and Hai Zhou, 4–5 km northwest of Tian'e, Tian'e Xian; *Guangxi*, CHINA; ca. 25°01′N, 107°07′E; captured Apr. 1990 by Luo Mingfei (pers. comm., 15 Oct. 1992); captive observed 15 Oct. 1992 at Tian'e. C:C-173.

Hongshui He, left bank, 9 km below Heke and 10 km below Heke, Tian'e Xian, 260–360 m; *Guangxi*, CHINA; 25°10′N, 106°58′E observed 29–30 Oct. 1992 by J. Fooden (cf. Fooden et al., 1994, p. 623). C:C-173.

Hongshui He, right bank, 500 m below Heke, Tian'e Xian, 260 m; *Guangxi*, CHINA; 25°14′N, 106°58′E; observed 19 Oct. 1992 by J. Fooden (cf. Fooden et al., 1994, p. 623). C:C-173.

Hopeh. See Xinglong Xian, southern.

Hoshangabad. See Sohagpur.

Hot Mix Plant. See Aligarh.

Hot Springs (= Garampani). Jaintia Hills, 2400 ft (= 730 m); *Assam*, INDIA; 25°31′N, 92°34′E; collected 18 July 1920 by H. W. Wells (Hinton & Lindsay, 1926, p. 385); BNHS, 1. B:I-19.

Hotha Valley; *Yunnan*, CHINA; ca. 24°25′N, 97°55′E; captive purchased July 1868 by J. Anderson (1876, p. 275; 1879, pp. xvi, 56); ZSI, 1. B:C-61.

Houmda. See Ngamda.

Hsignolo. See Xi Golog.

Hsi-kiang. See Xi Jiang.

Hsi-o-lo. See Xi Golog.

Htingnan Triangle, 3500 ft (= 1070 m); *Kachin*, MYANMAR (= BURMA); 26°36′N, 97°53′E; collected 28 Jan. 1939 by R. Kaulback; BM(NH), 1. B:M-1.

Huagong Water Regulation Forest Reserve; *Guangxi*, CHINA; ca. 24°31′N, 104°58′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 128; letter, Aug. 1996). C:C-161.

Huai Ap Nang, right bank of Mae Nam Ping, 350 m; *Tak*, THAILAND; 17°25′N, 98°43′E; collected 29 Mar. 1967 by J. Fooden (1971, p. 18); FMNH, 1. B:T-5.

Huaiji; *Guangdong*, CHINA; 23°55′N, 112°10′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-207.

Huai Kwang Pah, left bank of Mae Nam Ping, 350 m; *Tak*, THAILAND; 17°28′N, 98°50′E; collected 29 Mar. 1967 by J. Fooden (1971, p. 18); CTNRC, 1; FMNH, 1 (in alcohol). B:T-5.

Huanglian Shan Water Regulation Forest Reserve; *Guangxi*, CHINA; ca. 23°35′N, 106°25′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 128; letter, Aug. 1996). C:C-168.

Huangliangping, Xingshan Xian; *Hubei*, CHINA; ca. 31°22′N, 110°53′E; observed Mar.–July 1982 by F. E. Poirier and Hu Hongxhin (1983, p. 387; Poirier, 1983, p. 124). C:C-44.

Huangqiao, Wuyanlin Nature Reserve, Taishun Xian, 650 m; *Zhejiang*, CHINA; 27°42′N, 119°48′E; collected Apr. 1981 by Zuge Yang (pers. comm., 24 Oct. 1985); HUBD, 1. C:C-68.

Huangshan; *Anhui*, CHINA; 30°10′N, 118°07′E; tissue sample obtained ca. 1991 by Zhang Yaping and Shi Liming (1993b, p. 589). C:C-62.

Huangtankou, Suichang Xian; *Zhejiang*, CHINA; 28°50′N, 118°54′E; captives acquired ca. Aug. 1981 by Fu Yiyuan and Wu Fuhai, Hangzhou Zoo (pers. comm., 25 Oct. 1985). C:C-64.

Huaping Nature Reserve; *Guangxi*, CHINA; ca. 25°36′N, 109°54′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 126; letter, Aug. 1996). C:C-184.

Huaping [Xian]; *Yunnan*, CHINA; ca. 26°37′N, 101°13′E; blood sample obtained before 1999 by Ding Bo, Zhang Yaping, and Hou Yidi (1998, p. 172). B:C-47.

Huashi, north of; Hebei CHINA; ca. 40°24′N, 117°30′E; reported 1940–1980 by local residents (Zhang et al., 1989, p. 379). C:C-1.

Hubei, CHINA; 29°–33°N, 109°–116°E; reported before 1992 by Jiang Xuelong, Wang Yingxiang, and Ma Shilai (1991, p. 244). Not mapped.

Hue, 0 m; *Thua Thien-Hue*, VIETNAM; 16°28′N, 107°36′E; collected Oct.–Dec. 1925 by J. Delacour, P. Jabouille, and W. P. Lowe (Delacour et al., 1927, p. 132; Delacour, 1940, pp. 21, 24); ?MNHN, 1–2 (not seen). C:V-33.

Huidong; *Guangdong*, CHINA; 22°58′N, 114°44′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-209.

Huishui; *Guizhou*, CHINA; 26°08′N, 106°36′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-124.

Huixan; *Gansu*, CHINA; 33°46′N, 106°06′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-17.

Huixan; *Henan*, CHINA; 35°32′N, 113°54′E; tissue sample obtained ca. 1991 by Zhang Yaping and Shi Liming (1993b, p. 589). C:C-8.

Hui-yao; *Yunnan*, CHINA; ca. 25°15′N, 98°30′E; collected 26 Apr. 1917 by R. C. Andrews (in Andrews & Andrews, 1918, pp. 298, 305); AMNH, 2; MCZ, 1. B:C-58.

Hule (= Huleu), Ningguo Xian, 200–500 m; *Anhui*, CHINA; ca. 30°21′N, 118°47′E; observed 1973–1986 by Xiong Chenpei (Wada et al., 1986, p. 83). C:C-55.

Hunan, CHINA; 25°–30°N, 110°–114°E; captives obtained Oct.–Nov. 1973 and May 1976 by museum collectors; SCIEA, 3. Not mapped.

Huong Binh. See Song-Ta-Voy.

Huong Him. See Song-Ta-Voy.

Huong Son (= Muong Son) District; *Ha Tinh*, VIETNAM; ca. 18°31′N, 105°28′E; collected 19 June 1985 by Nguyen Van Dung; FCXM, 1 (skull only). C:V-27.

Hutu Forest, above Rara Daha (= Lake), 3200 m; *Jumla*, NEPAL; ca. 29°35′N, 82°05′E; observed Oct. 1975 by T. Richie and R. Shrestha (Richie et al., 1978, p. 443; cf. Fooden, 1989, p. 44). A:N-6.

Hwang Liang Commune. See Huangliangping.

Hyderabad, 560 m; *Andhra Pradesh*, INDIA; 17°23′N, 78°29′E; observed 31 Mar. and 22 Apr. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 467). A:I-124.

Ibrahimpet, Banswada Taluk, Nizamabad District; *Andhra Pradesh*, INDIA; 18°23′N, 77°55′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18). A:I-117.

Ichang. See Yichang.

Imphal, ca. 4 mi (= 6.5 km) north of milestone 129 [km] on Dimapur Road, 3000 ft (= 900 m); *Manipur*, INDIA; 24°52′N, 93°56′E; collected 6 Nov. 1945 by M. L. Roonwal (1949, p. 84; 1950, p. 16 [misidentified as *M. assamensis*]); ZSI, 1. B:I-37.

Imphal, Mahabali Temple, 762 m; *Manipur*, INDIA; 24°49′N, 93°57′E; observed May–June 1974 and Feb. 1975 by R. P. Mukherjee (1978a, p. 276). B:I-37.

Indian Museum compound. See Calcutta.

Imperial Hunting Grounds. See Xinglong Xian, southern.

INDIA; 15°–35°N, 71°–97°E; collected before 1843 by Mr. Cross; BM(NH), 1 (skin only). Collected before 1844 by B. H. Hodgson; BM(NH), 1 (skull only). Collected before 1852 by unknown collectors; BM(NH), 2. Collected 15 Dec. 1925 by R. P. Page; BM(NH), 1 (skin only). Date and collector unknown; ZSI, 2 (skull only). Not mapped.

?INDIA; 15°–35°N, 71°–97°E; collected before 1852 by unknown collector; BM(NH), 1 (skin with skull inside). Not mapped.

Irrawaddy River, left bank, below Yenangyaung; *Magwe*, MYANMAR (= BURMA); ca. 20°27′N, 94°52′E; observed before 1879 by J. Anderson (1879, p. 57). B:M-26.

Jagannath Temple. See Puri.

Jagatsukh; *Himachal Pradesh*, INDIA; ca. 32°10′N, 77°15′E; reported 1978–1980 by A. J. Gaston, P. J. Garson, and M. L. Hunter, Jr. (1983, p. 300). A:I-14.

Jaggayyapet, Guntur District, 50 m; *Andhra Pradesh*, INDIA; 16°53′N, 80°06′E; observed 21 Apr. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 468). A:I-131.

Jaggayyapet, 4 km north of, Guntur District, 75 m; *Andhra Pradesh*, INDIA; 15°55′N, 80°07′E; observed 21 Apr. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 468). A:I-131.

Jagvedi Temple. See Chitrakut.

Jaintia Hills. See Hot Springs; Narpuh Reserved Forest.

Jaipur; *Rajasthan*, INDIA; 26°55′N, 75°49′E; observed Mar. 1956–Oct. 1960 by I. Prakash (1958, p. 154; 1962, p. 83). Observed ca. 1982–1988 by R. Mathur and L. D. Wolfe (Mathur, 1982, p. 11; Wolfe & Mathur, 1988, p. 535; Wolfe, 1992, p. 44). A:I-75.

Jaipur District; *Rajasthan*, INDIA; ca. 26°20′–27°50′N, 74°55′–76°50′E; observed 1981–1983 by P. K. Seth, S. Seth, G. L. Reddy, and P. K. Chopra (1992, p. 62). Not mapped.

Jakaram, 4 km southwest of, Warangal District, 325 m; *Andhra Pradesh*, INDIA; 18°08′N, 79°53′E; observed 19 Apr. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 467). A:I-120.

Jakka. See Sungri, ca. 2 km south of.

Jakko (= Jako; Jakoo; Jaku) Hill, Simla, 8500 ft (= 2600 m); *Himachal Pradesh*, INDIA; 31°06′N, 77°10′E; observed Feb. ?1836 by T. Hutton (1837, p. 935). Observed before 1888 by W. T. Blanford (1888b, p. 14). Observed Aug. 1972–Feb. 1973 by K. Wada (1984, p. 477). A:I–18.

Jakkpom, Banswada Taluk, Nizamabad District; *Andhra Pradesh*, INDIA; not precisely located, 18°05′–18°35′N, 77°45′–78°05′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18). Not mapped.

Jaldapara Wildlife Sanctuary; *West Bengal*, INDIA; ca. 26°38′N, 89°18′E; observed 23 Oct. 1965 by M. Krishnan (1972, p. 540). Reported Jan.–June 1966 by J. J. Spillett (1967, p. 549). B:I-9.

Jalpaiguri. See Bharnabhari; Hasimara.

Jamduar vicinity, <270 m; *Assam*, INDIA; ca. 26°43′N, 89°53′E; observed in 1957 by G. A. von Maydell (Oboussier & von Maydell, 1959, p. 106). Observed May–June 1973 by R. P. Mukherjee and S. S. Saha (1974, p. 337; Mukherjee, 1978b, p. 742). B:I-10.

Jammu; *Jammu & Kashmir*, INDIA; 32°44′N, 74°52′E; observed ca. 1982 by Y. R. Malhotra and D. N. Sahi (1982, p. 27). A:I-5.

Jammu District; *Jammu & Kashmir*, INDIA; 32°20′–32°55′N, 74°40′–75°20′E; observed 1981–1983 by P. K. Seth, S. Seth, G. L. Reddy, and P. K. Chopra (1992, p. 62). Not mapped.

Jammu & Kashmir, southern border with Pakistan, INDIA; ca. 32°30′N, 74°40′E; trapped Nov. 1976 by animal dealer (Remfry, 1982, p. 144). A:I-6.

Jäntschin. See Yanjing.

Japisojia; *Assam*, INDIA; ca. 27°03′N, 94°48′E; reported 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 31). B:I-25.

Jawan; *Uttar Pradesh*, INDIA; 28°02′N, 78°06′E; observed 1959–1975 by C. H. Southwick and M. F. Siddiqi (1977, p. 342). Observed Jan. 1990–Mar. 1991 by E. Imam and H. S. A. Yahya (1995, p. 2). A:I-69.

Jaypore Agency. See Malkangiri.

Jayrapar; *Assam*, INDIA; ca. 27°02′N, 94°39′E; reported 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 31). B:I-25.

Jegu Xiang, Yushu Xian; *Qinghai*, CHINA; 32°42′N, 97°15′E; collected 30 May and 10 June 1963 by Shou Zhongchan; NWPIB, 2 (including 1 skin only). B:C-18.

Jenli, 2–3 km north of, Mulun Subcounty, Huanjiang Xian, 670 m; *Guangxi*, CHINA; ca. 25°07′N, 108°01′E; collected fall 1991 by Hu Huguan (pers. comm., 5 Nov. 1992); skeleton examined 5 Nov. 1992 at Jenli. C:C-177.

Jessore, BANGLADESH; ca. 23°15′N, 89°15′E; reported before 1982 by M. A. R. Khan (1981, p. 13). B:Ba-19.

Jeypore Agency. See Malkangiri.

Jhajjarkotli, Udhampur Subdistrict; *Jammu & Kashmir*, INDIA; ca. 32°56′N, 75°08′E; observed by Y. R. Malhotra and D. N. Sahi (1982, p. 27). A:I-10.

Jhanji; *Assam*, INDIA; ca. 26°52′N, 94°30′E; reported 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 31). B:I-25.

Jhansi; *Uttar Pradesh*, INDIA; 25°26′N, 78°35′E; bacteriological survey conducted before 1985 by J. P. Tiwari and A. K. Shukla (1984, p. 498). A:I-83.

Jhilla; *West Bengal*, INDIA; ca. 22°00′N, 89°00′E; observed 1955–1960 by A. K. Mukherjee (Mukherjee & Gupta, 1965, p. 145). B:I-2.

Jhirna, ca. 17 mi (= 27 km) west of Ramnagar, Kumaun region, 1500 ft (= 460 m); *Uttar Pradesh*, INDIA; 29°27′N, 78°54′E; collected 17 Jan. 1914 by C. A. Crump (in Wroughton, 1914, p. 284); ZSI, 1. A:I-33.

Jian'ou Xian; *Fujian*, CHINA; ca. 27°03′N, 118°19′E; reported Aug. 1980 by Zheng Xueqing (1984, p. 145). C:C-72.

Jianfengling, Ledong Xian, Hainan Dao, 800–900 m; *Hainan*, CHINA; 18°43′N, 108°53′E; collected 5 Dec. 1962 by Liu Zhenhe, SCIEA (pers. comm., 26 Nov. 1985); SCIEA, 1. Reported before 1982 by Zeng Qingsong (1982, p. 69). C:C-236.

Jiangkou; *Guizhou*, CHINA; 27°42′N, 108°50′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-115.

Jianyang Xian; *Fujian*, CHINA; ca. 27°20′N, 118°07′E; reported July 1982 by Zheng Xueqing (1984, p. 145). C:C-73.

Jiaqiaolin Water Regulation Forest Reserve; *Guangxi*, CHINA; ca. 24°46′N, 110°06′E; observed 1976, 1986, 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 127; letter, Aug. 1996). C:C-194.

Jigzhi (= Jiuzhi); *Qinghai*, CHINA; 33°28′N, 101°29′E; reported before 1998 (Zhang et al., 1997, p. 58). B:C-24.

Jilian, Yi Xian, 400–600 m; *Anhui*, CHINA; ca. 30°00′N, 118°00′E; observed 1973–1986 by Xiong Chenpei, K. Wada, and Wang Qishan (Wada et al., 1986, pp. 83, 88). C:C-62.

Jincheng; *Shanxi*, CHINA; 35°30′N, 112°50′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-6.

Jinchengjiang; *Guangxi*, CHINA; 24°42′N, 108°02′E; tissue sample obtained ca. 1991 by Zhang Yaping and Shi Liming (1993b, p. 589). C:C-178.

Jind District; *Haryana*, INDIA; ca. 29°19′N, 76°19′E; observed 1981–1983 by P. K. Seth, S. Seth, G. L. Reddy, and P. K. Chopra (1992, p. 62). A:I-38.

Jingdong Xian; *Yunnan*, CHINA; 24°28′N, 100°54′E; reported before 1992 by Jiang Xuelong, Wang Yingxiang, and Ma Shilai (1991, p. 243). Immunological survey conducted before 1996 by Duan Xingsheng, Liu Yuanwei, Wu Jing, Dao Weiying, and Liu Jianghai (1995, p. 411). Blood sample obtained before 1999 by Ding Bo, Zhang Yaping, and Hou Yidi (1998, p. 172). B:C-71.

Jinggangshan; *Jiangxi*, CHINA; 26°42′N, 114°07′E; reported before 1998 (Zhang et al., 1997, p. 58). Report unverified; *M. thibetana* only macaque verified at this locality (Li Xiongshan, Jinggangshan Nature Reserve Bureau, pers. comm., 4 Nov. 1985; Liu Zhenhe, SCIEA, pers. comm., 25 Nov. 1985). Not mapped.

Jinggu Xian; *Yunnan*, CHINA; ca. 23°28′N, 100°42′E; immunological survey conducted before 1996 by Duan Xingsheng, Liu Yuanwei, Wu Jing, Dao Weiying, and Liu Jianghai (1995, p. 411). B:C-74.

Jinping; *Yunnan*, CHINA; ca. 22°50′N, 103°15′E; collected date unknown by Ye Zongyao (Quan Guoqiang, pers. comm., 25 Aug. 1983); IZCAS, 1 (skull only). C:C-150.

Jinzhong Shan Bird Reserve; *Guangxi*, CHINA; 24°45′N, 104°55′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 129; letter, Aug. 1996). C:C-155.

Jirna. See Jhirna.

Jishou; *Hunan*, CHINA; 28°19′N, 109°43′E; tissue sample obtained ca. 1991 by Zhang Yaping and Shi Liming (1993b, p. 589). C:C-113.

Jiufeng Shan; *Fujian*, CHINA; ca. 27°00′N, 118°48′E; reported Nov. 1983 by Zheng Xueqing (1984), p. 145). C:C-71.

Jiuhua Shan, ca. 30 km east of; *Anhui*, CHINA; ca. 30°25′N, 118°05′E; observed 1973–1978 by Xiong Chenpei (Wada et al., 1986, p. 82). C:C-51.

Jiuhua Shan, ca. 30 km northeast of; *Anhui*, CHINA; ca. 30°40′N, 118°00′E; observed 1973–1982 by Xiong Chenpei (Wada et al., 1986, p. 82). C:C-52.

Jiuhua Shan, Qingyang Xian, 400–800 m; *Anhui*, CHINA; ca. 30°27′N, 117°48′E; observed 1973–1986 Xiong Chenpei (Wada et al., 1986, p. 83). C:C-50.

Jiuwanshan Water Regulation Forest Reserve;

Guangxi, CHINA; ca. 25°14′N, 108°43′E; observed 1976, 1986, 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 127, letter, Aug. 1996). C:C-181.

Jiuzhi. See Jigzhi.

Jixi; *Anhui*, CHINA; 30°05′N, 118°36′E; reported before 1988 (Zhang et al., 1997, p. 58). C:C-60.

Jiyuan, ca. 20 km northeast of; 750 m; *Henan*, CHINA; ca. 35°11′N, 112°41′E; observed 1981–1988 by Qu Wenyuan, Zhang Yongzu, D. Manry, and C. H. Southwick (1993, p. 617; cf. Southwick et al., 1991, p. 25). C:C-12.

Jiyuan, ca. 30 km northwest of; 750 m; *Henan*, CHINA; ca. 35°11′N, 112°23′E; observed 1981–1988 by Qu Wenyuan, Zhang Yongzu, D. Manry, and C. H. Southwick (1993, p. 617; cf. Southwick et al., 1991, p. 25). C:C-4.

Jiyuan, ca. 80 km west-northwest of, 750 m; *Henan*, CHINA; ca. 35°12′N, 112°05′E; observed 1981–1988 by Qu Wenyuan, Zhang Yongzu, D. Manry, and C. H. Southwick (1993, p. 617; cf. Southwick et al., 1991, p. 25). C:C-13.

Jodhpur; *Rajasthan*, INDIA; 26°17′N, 73°02′E; observed before 1960 by I. Prakash (1959, p. 39). Observed May 1979 by M. L. Roonwal (Bhargava, 1984, p. 43). A:I-80.

Judi-Jatakia, near Hologuri-Kalugaon; *Assam*, INDIA; ca. 26°56′N, 94°39′E; observed 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 32). B:I-25.

Julongshan Nature Reserve, Suichang Xian; *Zhejiang*, CHINA; 28°21′N, 118°53′E; captives and skins observed in local shops, 1980–1981, by Tang Ziying, FUBD (pers. comm., 19 Oct. 1985). Observed 1982 by Sheng Helin, ECNU (pers. comm., 19 Oct. 1985). C:C-66.

Kaeng Mae Hat (rapids), Mae Nam Ping (river), below Chiang Mai, 850 ft (= 260 m); *Chiang Mai*, THAILAND; 17°51′N, 98°41′E; collected 14 Apr. 1916 by K. G. Gairdner (Kloss, 1917, p. 247); ZRC, 1 (holotype of *Macaca siamica*). B:T-4.

Kafiristan. See Nurestan.

Kaiyang; *Guizhou*, CHINA; 27°04′N, 106°58′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-127.

Kakara, Damoh District, 1200 ft (= 370 m); *Madhya Pradesh*, INDIA; ca. 23°50′N, 79°27′E; collected 12 May 1912 by C. A. Crump (in Wroughton & Ryley, 1913, p. 46); BM(NH), 1 (skin only). A:I-94.

Kakhyen Hills. See Tengchong.

Kakkaraparu, Peravalli Block, East Godavari District; *Andhra Pradesh*, INDIA; not precisely located, 16°40′–17°50′N, 81°30′–82°35′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 19). Not mapped.

Kakori; *Uttar Pradesh*, INDIA; 26°54′N, 80°48′E; observed 1 Dec. 1959–30 Mar. 1960 by P. Jay (1963, p. 274; 1965, p. 212). A:I-66.

Kalabokhani, Sylhet; *Sylhet*, BANGLADESH; ca. 24°54′N, 91°52′E; observed Feb. 1990–June 1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, p. 76). B:Ba-10.

Kali Bari Temple. See Simla.

Kam Shan Entrance, Kowloon Reservoir Area; *Xianggang* (= *Hong Kong*), CHINA; ca. 22°22′N, 114°09′E; population probably artificially introduced (Herklots, 1951, p. 83). Observed July–Aug. 1980 and July–Aug. 1981 by C. H. Southwick and K. L. Southwick (1983, p. 19). Observed 10 Jan.–3 Feb. 1987 by C. H. Southwick and D. Manry (1987, p. 48). Observed Feb. 1995 by K. A. Bolton, V. M. Campbell, and F. D. Burton (1998, p. 197). C:C-210.

Kamdech. See Landay Sind.

Kamta, Mukhrbind Temple, Banda District; *Uttar Pradesh*, INDIA; not precisely located, 24°50′–25°50′N, 80°10′–81°35′E; observed Sept. 1959–Feb. 1960, 1964–1965, and 1979–1980 by C. H. Southwick, M. A. Beg, and M. R. Siddiqi (1961a, p. 543; Southwick and Siddiqi, 1966, p. 312; Southwick et al., 1983, p. 437). Not mapped.

Kamu Valley; *Konarha*, AFGHANISTAN; ca. 35°25′N, 71°25′E; observed July–Aug. 1970 by C. Naumann and G. Nogge (1973, p. 92). A:A-1.

Kangding (= K'ang-ting; Tasin Lou); *Sichuan*, CHINA; 30°03′N, 102°02′E; collected June–July 1890 by H. d'Orleans (Bonvalot, 1891, vol. 2, p. 210; 1892, p. 506); MNHN, 1 (holotype of Macacus vestitus). B:C-27.

Kangra, 2500 ft (= 760 m); *Himachal Pradesh*, INDIA; 32°06′N, 76°16′E; collected 20 Mar. 1921 by H. Whistler; BNHS, 2. Trapped in 1976 by R. V. Henrickson (Karr et al., 1979, p. 789; 1980, p. 201). A:I-12.

Kangra Fort, 2450 ft (= 750 m); *Himachal Pradesh*, INDIA; ca. 32°05′N, 76°16′E; collected 18 Mar. 1921 by H. W. Wells (Lindsay, 1926, p. 599); BM(NH), 1. A:I-12.

Kanha National Park; *Madhya Pradesh*, INDIA; ca. 22°20′N, 80°40′E; reported before 1997 by K. K. Gurung and R. Singh (1996, p. 96). A:I-supplementary.

Kangxian; *Gansu*, CHINA; 33°26′N, 105°37′E;

reported before 1998 (Zhang et al., 1997, p. 58). C:C-19.

Kansrao; *Uttar Pradesh*, INDIA; 30°05′N, 78°08′E; observed spring 1953 by A. Nolte (1956, p. 180). A:I-27.

Kanti vicinity, Chitral District; *North-West Frontier*, PAKISTAN; ca. 35°35′N, 71°41′E; reported before 1978 by T. J. Roberts (1977, p. 86). A:P-1.

Kaotai (= Kootai), lower Kunar (= Chitral) River, 3600 ft (= 1100 m); *North-West Frontier*, PAKISTAN; ca. 35°20′N, 71°35′E; collected early Feb. 1914 by F. D. Stirling (Wroughton, 1918, p. 553); BM(NH), 1 (holotype of *Macaca mulatta mcmahoni*). A:P-1.

Kao Tien. See Kuatun.

Kaptai; *Rangamati*, BANGLADESH; 22°21′N, 92°17′E; observed Feb. 1990–June 1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, p. 76). B:Ba-35.

Kaptai, south of; *Chittagong*, BANGLADESH; ca. 22°00′N, 92°00′E; tentatively reported July–Nov. 1976 by K. M. Green (1978, p. 146). B:Ba-38.

Kaptai Lake; *Rangamati*, BANGLADESH; ca. 22°30′N, 92°14′E; observed 1975–1976 by J. R. Oppenheimer, A. W. Akonda, and K. Z. Husain (1983, p. 193). B:Ba-35.

Karampodu, Ipur Taluk, Guntur District; *Andhra Pradesh*, INDIA; not precisely located. 16°05′–16°25′N, 79°35′–79°55′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 19). Not mapped.

Kareilly, west of; *Uttar Pradesh*, INDIA; ca. 28°16′N, 79°22′E; observed Apr.–June 1965 by R. P. Mukherjee (1969, p. 47). A:I-52.

Karen Chaung, Pidaung Reserve, Myitkyina District, 500 ft (= 150 m); *Kachin*, MYANMAR (= BURMA); ca. 25°25′N, 97°15′E; collected 25 May 1936 by H. C. Smith (Napier, 1981, p. 21); BM(NH), 2 (including 1 skin only). B:M-5.

Karghena, west of; *Uttar Pradesh*, INDIA; ca. 28°16′N, 79°22′E; observed Apr.–June 1965 by R. P. Mukherjee (1969, p. 47). A:I-52.

Karkara. See Kakara.

Karkatgarh (= Karkatnagar); *Bihar*, INDIA; ca. 24°53′N, 83°22′E; observed 1959–1970 by M. Krishnan (1972, p. 540). A:I-89.

Karnal District; *Haryana*, INDIA; ca. 29°44′N, 76°44′E; observed 1981–1983 by P. K. Seth, S. Seth, G. L. Reddy, and P. K. Chopra (1992, p. 62). A:I-23.

Karnali River, ca. 30 km above mouth, Karnali Bardia Game Reserve; *Bardia*, NEPAL; ca. 28°37′N, 81°19′E; observed 20 Feb.–10 Mar. 1976 by J. Teas (1983, p. 214). A:N-5.

Karnali River-Aurn River, ca. 10 km above confluence, Karnali Bardia Game Reserve; *Bardia*, NEPAL; ca. 28°26′N, 81°15′E; observed 20 Feb.–10 Mar. 1976 by J. Teas (1983, p. 214). A:N-5.

Karrachi (= Karachi). See PAKISTAN.

Kasauli, Siwalik Hills; *Himachal Pradesh*, INDIA; 30°55′N, 76°57′E; observed before 1984 by M. Singh and R. S. Pirta (1983, p. 81). A:I-18.

Kashmir (region); *Jammu & Kashmir*, INDIA; ca. 34°N, 75°E; obtained before 1857 by Theobald Collection/ Prof. Oldham; BM(NH), 1 (skull only, species identification questionable; cf. Napier, 1981, p. 26). Acquired before 1872 by Zoological Society of London (Anderson, 1879, p. 63; Elliot, 1913, p. 202; Pocock, 1932, p. 540); BM(NH), 1. Collected in 1985 by W. L. Abbott; USNM, 1. Not mapped.

Kasol; *Himachal Pradesh*, INDIA; ca. 32°00′N, 77°20′E; reported 1978–1980 by A. J. Gaston, P. J. Garson, and M. L. Hunter, Jr. (1983, p. 300). A:I-15.

Kathmandu. See Katmandu.

Kathpar; *Assam*, INDIA; ca. 27°00′N, 94°37′E; reported 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 31). B:I-25.

Kathua vicinity; *Jammu & Kashmir*, INDIA; ca. 32°22′N, 75°31′E; trapped in 1976 by R. V. Henrickson (Karr et al., 1979, p. 789; 1980, p. 201). A:I-8.

Katmandu; *Katmandu Valley*, NEPAL; 27°43′N, 85°18′E; observed before 1979 by B. Marriott (1978b, p. [27]). A:N-12.

[*Katmandu Valley*], NEPAL; 27.5°–28°N, 85°–85.5°E; collected before 1845 by B. H. Hodgson (Scully, 1888, p. 234; Napier, 1981, p. 24); BM(NH), 7 (including 3 skulls only [1 not seen]); probably includes part of type series of *Macacus Oinops*. Not mapped.

Kaukori. See Kakori.

Kausa Gutta, Adilabad District, 300 m; *Andhra Pradesh*, INDIA; 19°07′N, 78°43′E; observed 25 Mar. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 466). A:I-114.

Kazinag; *Azad Kashmir*; PAKISTAN; ca. 34°00′N, 73°35′E; reported before 1984 by M. Nawaz (1983, p. 6). A:P-12.

Kaziranga National Park; *Assam*, INDIA; 26°35′–26°45′N, 93°10′–93°30′E; reported before 1988 by A. Choudhury (1987, p. 162). Not mapped.

K. B. Road. See Dhaka.

Kedarnath Sanctuary, 1400–2100 m; *Uttar Pradesh*, INDIA; ca. 30°25′N, 79°15′E; observed 1979–1982 by A. N. Singh (1982, p. 8). A:I-29.

Kengma. See Gengma.

Kerwada Forest. See Kherwada Forest.

Khair, Aligarh District; *Uttar Pradesh*, INDIA; 27°57′N, 77°50′E; observed Sept. 1959–Feb. 1960 by C. H. Southwick, M. A. Beg, and M. R. Siddiqi (1961a, p. 542). Observed May–June 1976 by R. S. Pirta (1984, p. 542). Observed May–June 1976 by R. S. Pirta (1984, p. 272). Observed Jan. 1990–Mar. 1991 by E. Imam and H. S. A. Yahya (1995, p. 2). A:I-44.

Khair, Tahsil; *Uttar Pradesh*, INDIA; 27°50′–28°10′N, 77°30′–78°05′E; observed 1975–1980 by P. K. Seth, S. Seth, and A. K. Shukla (1983, p. 38; Seth & Seth, 1983, p. 63). Not mapped.

Khair Inter College. See Khair, Tahsil.

Khammam; *Andhra Pradesh*, INDIA; 17°15′N, 80°09′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18). A:I-132.

Khanamukh; *Assam*, INDIA; ca. 26°57′N, 94°28′E; reported 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 31). B:I-25.

Khanapur, 3–5 km west of, Adilabad District, 350 m; *Andhra Pradesh*, INDIA; 19°04′N, 78°37′E; observed 24 Mar. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 466). A:I-114.

Khao Nang Rum, western slope; *Uthai Thani*, THAILAND; ca. 15°30′N, 99°17′E; observed 1973–1977 by A. A. Eudey (1979, pp. 91–97, table 7). B:T-9.

Khao Nang Rum Research Station, 400–700 m; *Uthai Thani*, THAILAND; ca. 15°28′N, 99°18′E; observed Mar.–May 1988 by S. Srikosamatara (1993, p. 37). B:T-9.

Khasi Hills. See Nongpoh.

Khatuajhuri; *West Bengal*, INDIA; not precisely located, 21°30′–22°15′N, 88°40′–89°10′E; observed 1955–1960 by A. K. Mukherjee (Mukherjee & Gupta, 1965, p. 145). Not mapped.

Kheiber. See Khyber Pass vicinity.

Kheo Ting-Ta Ke. See Tat Ke vicinity.

Kheri Sahd (= Kheri Saad), Rohtak District; *Haryana*, INDIA; ca. 28°56′N, 76°34′E; observed July–Oct. 1979 by R. Singh (1984, p. 50; Singh et al., 1984, p. 264). A:I-37.

Kherwada Forest, Surat District; *Gujarat*, INDIA; ca. 21°20′N, 73°30′E; observed 1972–1973 by N. Koyama and P. B. Shekar (1981, p. 248). A:I-98.

Khirganga. See Pulga.

Khyber Pass vicinity; *North-West Frontier*, PAKISTAN; ca. 34°05′N, 71°10′E; reported ca. 1525 by Z. M. Bābur (1921 [translation], p. 218). A:P-4.

Kiang-ka; *Sichuan*, CHINA; ca. 30°00′N, 99°00′E; reported 31 Aug. 1877 by local residents (Gill, 1883, p. 230). B:C-32.

Kiangsu. See *Guangxi*.

Kian Tatie. See Ngamda.

Kia-ting. See Leshan.

Kien Thiet vicinity, Yen Son District; *Tuyen Quang*, VIETNAM; ca. 21°58′N, 105°22′E; reported Feb.–Apr. 1992 by R. Ratajszczak, Ngoc Can, and Pham Nhat (1992, p. 20). C:V-16.

Kin, west bank of lower Chindwin River; *Sagaing*, MYANMAR (= BURMA); 22°46′N, 94°42′E; collected 9 June 1914 by G. C. Shortridge and S. A. Macmillan (Shortridge in Wroughton, 1916a, p. 294); BNHS, 1. B:M-24.

Kindat; *Sagaing*, MYANMAR (= BURMA); 23°44′N, 94°26′E; collected before 1911 by C. H. Hobart; BM(NH), 1, (skull only). B:M-18.

Kindat, 20 mi (= 32 km) northwest of, Chin Hills, 600 ft (= 180 m); *Chin*, MYANMAR (= BURMA); ca. 23°50′N, 94°10′E; collected 20 Jan. 1915 by J. M. Mackenzie (Wroughton, 1916c, p. 759); BM(NH), 1. B:M-16.

King's Forest. See Gokarna.

Kintachié. See Ngamda.

Kistawar. See Dunwein.

Kloster Nam miu. See Luofu Shan.

Koditan, Hongshui He, right bank, Tian'e Xian, 260 m; *Guangxi*, CHINA; 25°05′N, 106°59′E; observed 28 Oct. 1992 by J. Fooden (cf. Fooden et al., 1994, p. 623). C:C-173.

Koh-e-Sefid. See Khyber Pass vicinity.

Kokara. See Kakara.

Kokkoaing (= Kokhoanig), 500 ft (= 150 m); *Mandalay*, MYANMAR (= BURMA); 20°47′N, 95°56′E; collected 14 June 1937 by H. C. Smith (cf. Moore & Tate, 1965, p. 323; Napier, 1981, p. 21); BM(NH), 1. B:M-28.

Keoladeo Ghana National Park. See Bharatpur.

Komlancha (Komallancha), Banswada Taluk, Nizamabad District; *Andhra Pradesh*, INDIA; 18°16′N, 77°55′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18). A:I-117.

Konapur, Banswada Taluk, Nizamabad District; *Andhra Pradesh*, INDIA; 18°23′N, 77°59′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18). A:I-117.

Kondapalle, Krishna District, 70 m; *Andhra Pradesh*, INDIA; 16°37′N, 80°33′E; observed 13

May 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 468). A:I-144.

Kondegattu Temple, Mallial Taluk, Karimnagar District; *Andhra Pradesh*, INDIA; ca. 18°42′N, 78°58′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18). A:I-119.

Kondra Mutla (= Kondramadla), Ipur Taluk, Guntur District, 125 m; *Andhra Pradesh*, INDIA; 16°08′N, 79°46′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 19). Observed 30 Apr. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 469). A:I-147.

Kongbo; *Xizang* (= *Tibet*), CHINA; ca. 29°30′N, 94°45′E; captive observed at Lu, 19 Aug. 1913, by F. M. Bailey (1914, map; 1957, p. 171; cf. Fooden, 1982a, p. 52). B:C-10.

Kootai. See Kaotai.

Kosi River, left bank; *Saptari*, NEPAL; ca. 26°35′N, 86°55′E; collected Mar. 1887 by H. d'Orleans (1889, pp. 225, 379); museum unknown (not seen). B:N-3.

Kota; *Rajasthan*, INDIA; 25°11′N, 75°50′E; reported before 1965 by I. Prakash (letter, 25 Aug. 1964). A:I-81.

Kotanemalipuri, Guntur District, 100 m; *Andhra Pradesh*, INDIA; 16°28′N, 79°56′E; observed 9 May 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 468). A:I-145.

Kotgay (= Cotgai), east of; *Nangarhar*, AFGHANISTAN; ca. 34°00′N, 70°20′E; reported before 1972 by A. Puget (1971, p. 201) A:A-10.

Kotgay (= Cotgai), northeast of; *Nangarhar*, AFGHANISTAN; ca. 34°04′N, 70°00′E; reported before 1972 by A. Puget (1971, p. 201). A:A-9.

Kothagudem, Khammam District, 100 m; *Andhra Pradesh*, INDIA; 17°32′N, 80°38′E; observed 20 Apr. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 467). A:I-135.

Kothagudem, 4 km north of, Khammam District, 100 m; *Andhra Pradesh*, INDIA; 17°34′N, 80°38′E; observed 20 Apr. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 467). A:I-135.

Kotihar, 7000 ft (= 2100 m); *Jammu & Kashmir*, INDIA ca. 33°45′N, 75°10′E; collected 3 and 18 Oct. 1910 by W. L. Abbott; USNM, 2. A:I-3.

Kouchlaus, south of; *Konarha*, AFGHANISTAN; ca. 35°20′N, 71°15′E; reported before 1972 by A. Puget (1971, p. 201). A:A-1.

Kounar. See Landay Sind, left bank, near confluence with Kunar River.

Kowloon; *Xianggang* (= *Hong Kong*), CHINA; ca. 22°15′–22°30′N, 114°10′–114°25′E; reported in 1992 by J. R. Fellowes (Southwick & M. F. Siddiqi, 1994b, p. 52). Not mapped.

Kowloon Reservoir vicinity. See Eagle's Nest Trail; Kam Shan Entrance.

Kuatun; *Fujian*, CHINA; ca. 27°51′N, 117°48′E, collected 15 and 28 Nov. 1873 by A. David (1875, vol. 2, pp. 260, 281, 288); MNHN, 2 (including 1 skin only). Collected before 1898 by C. B. Rickett (Rickett & de La Touche, 1896, p. 489; Napier, 1981, p. 22; Fooden, 1983, p. 16); BM(NH), 1 (skull only). Collected 12 May 1898 by J. de la Touhe (in Thomas, 1899, p. 769; Fooden, 1983, p. 16); BM(NH), 1. Collected Nov. 1898 by C. B. Rickett (Napier, 1981, p. 22; Fooden, 1983, p. 16); BM(NH), 1 (holotype of *Pithecus littoralis*). Collected 16 May–24 June 1926 by F. T. Smith (1926, p. 131; Sowerby, 1929, p. 315); museum unknown (not seen). C:C-76.

Kuchipudi, Tenali Taluk, Guntur District; *Andhra Pradesh*, INDIA; 16°10′N, 80°40′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 19). A:I-143.

Kucun, Longquan Xian; *Zhejiang*, CHINA; ca. 28°05′N, 119°07′E; captives acquired 1960–1970 by Fu Yiyuan and Wu Fuhai, Hangzhou Zoo (pers. comm., 25 Oct. 1985). C:C-67.

Kufri, ca. 0.5 km southeast of; *Himachal Pradesh*, INDIA; ca. 31°06′N, 77°17′E; observed Aug. 1972–Feb. 1973 by K. Wada (1984, p. 474). A:I-18.

Kufri, ca. 1.5 km southeast of; *Himachal Pradesh*, INDIA; ca. 31°05′N, 77°18′E; reported Aug. 1972–Feb. 1973 by K. Wada (1984, p. 474). A:I-18.

Kufri, ca. 3 km southeast of; *Himachal Pradesh*, INDIA; ca. 31°04′N, 77°18′E; observed Aug. 1972–Feb. 1973 by K. Wada (1984, p. 474). A:I-18.

Kullu Valley. See Kulu Valley.

Kulsi [River], South Kamrup, 750 ft (= 230 m); *Assam*, INDIA; ca. 26°00′N, 91°23′E; collected 25 Aug. 1920 by H. W. Wells (Hinton & Lindsay, 1926, p. 385); BNHS, 1. B:I-15.

Kulu District; *Himachal Pradesh*, INDIA; 31°58′N, 77°06′E; observed before 1982 by M. L. Roonwal and P. C. Tak (1981, p. 96). A:I-15.

Kulu Valley, 1150–2500 m; *Himachal Pradesh*, INDIA; ca. 32°00′N, 77°10′E; reported before 1991 by O. P. Lal (1990, p. 123). A:I-15.

Kumaun (= Kumaon) Hills; *Uttar Pradesh*, INDIA; ca. 29°20′N, 79°30′E; observed before

1982 by M. L. Roonwal and P. C. Tak (1981, p. 96). A:I-32.

Kumpawapi Park, 170 m; *Udon Thani*, THAILAND; 17°07′N, 103°02′E; observed July 1989 and Jan. 1991 by N. Aggimarangsee (1992, p. 118; pers. comm., Oct. 1993). C:T-1.

Kumtatchie. See Ngamda.

Kunar River, lower; *North-West Frontier*, PAKISTAN ca. 35°25′N, 71°40′E; reported before 1902 by A. H. McMahon (1901a, p. 4). A:P-1.

Kuo-Lo. See Golog Zangzu Zizhuzhou.

Kurukshetra District; *Haryana*, INDIA; ca. 29°59′N, 76°51′E; observed 1981–1983 by P. K. Seth, S. Seth, G. L. Reddy, and P. K. Chopra (1992, p. 62). A:I-24.

Kyirong. See Gyirong.

Ky Son, Ky Anh District; *Ha Tinh*, VIETNAM; 17°57′N, 106°06′E; collected 26 Jan. 1964 by Nguyen Lien (Dao, 1985, p. 233, 242, misidentified as *M. assamensis*; Dang et al., 1994, p. 165; cf. Nisbitt & Ciochon, 1993, p. 772); IEBR, 1 (skin only). C:V-29.

Lagou Bird Reserve; *Guangxi*, CHINA; ca. 24°38′N, 110°04′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 129; letter Aug. 1996). C:C-194.

Lai Chau, VIETNAM; 20°50′–22°50′N, 102°10′–103°50′E; collected in 1963 by unknown collector; IEBR, 1 (skin only). Not mapped.

Lakhimpur. See Margherita.

Lakuwa, 980–2300 m; *Dhankuta*, NEPAL; 27°28′N, 87°10′E; observed in 1997 and 1999 by M. K. Chalise and M. Ghimire (1998, p. 12). B:N-supplementary.

Lal Kuan; *Delhi*, INDIA; ca. 28°30′N, 77°20′E; reported Feb. 1990 by I. Malik and R. L. Johnson (1994, p. 237). A:I-41.

Lamsakhang, Cachar District, 200 ft (= 60 m); *Assam*, INDIA; 25°48′N, 93°06′E; collected 10 Sept. 1920 by H. W. Wells (Hinton & Lindsay, 1926, p. 385); BM(NH), 1. B:I-20.

Lancang Jiang (= Mekong River), Lincang District; *Yunnan*, CHINA; ca. 24°00′N, 100°23′E; reported before 1996 by Lan Daoying and Guo Guang (1995, p. 6). B:C-70.

Lancang Xian; *Yunnan*, CHINA; ca. 22°32′N, 99°56′E; immunological survey conducted before 1996 by Duan Xingsheng, Liu Yuanwei, Wu Jing, Dao Weiying, and Liu Jianghai (1995, p. 411). B:C-79.

Landay Sind, left bank, near confluence with Kunar River; *Konarha*, AFGHANISTAN; 35°21′N, 71°33′E; observed before 1972 by A. Puget (1971, p. 200). A:A-1.

Landay Sind, left bank, near Pule Saret; *Konarha*, AFGHANISTAN; 35°22′N, 71°33′E; observed before 1972 by A. Puget (1971, p. 200). A:A-1.

Landay Sind, near Chascoup; *Konarha*, AFGHANISTAN; 35°31′N, 71°22′E; observed before 1972 by A. Puget (1971, p. 199). A:A-1.

Landay Sind, near Merdech; *Konarha*, AFGHANISTAN; 35°23′N, 71°32′E; observed before 1972 by A. Puget (1971, p. 200). A:A-1.

Landay Sind, right bank, between Mandagal and Ormul; *Konarha*, AFGHANISTAN; 35°28′N, 71°20′E; observed before 1972 by A. Puget (1971, p. 199). A:A-1.

Landay Sind, right bank, near Sang e Safed; *Konarha*, AFGHANISTAN; 35°22′N, 71°32′E, observed before 1972 by A. Puget (1971, p. 200). A:A-1.

Landay Sind Valley, near Kamu Valley; *Konarha*, AFGHANISTAN; ca. 35°25′N, 71°25′E; observed July 1970 by C. Naumann and G. Nogge (1973, p. 92). A:A-1.

Landay Sind Valley, southern slope; *Konarha*, AFGHANISTAN; ca. 35°25′N, 71°25′E; observed 26 Dec. 1971 by C. Naumann and G. Nogge (1973, p. 92). A:A-1.

Landrai Valley, northern Dir District; *North-West Frontier*, PAKISTAN; ca. 35°30′N, 72°00′E; reported before 1978 by T. J. Roberts (1977, p. 86). A:P-2.

Lang Son, VIETNAM; 21°25′–22°50′N, 106°05′–107°20′E; collected 1962 by unknown collector; ZMVNU, 1 (skull only). C:V-12.

Lan-tao. See Dahao Dao.

Laodian, Lin'an Xian, 1000 m; *Zhejiang*, CHINA; ca. 30°20′N, 119°25′E; observed Aug. 1983 by Zhang Minhua, ZMNH (pers. comm., 24 Oct. 1985). C:C-57.

Laoshan, Jinxiu Subcounty, Jinxiu Xian; *Guangxi*, CHINA; ca. 24°07′N, 110°12′E; captured Sept. 1992 by Shu Jenyung (pers. comm., 16 Nov. 1992); captive observed 16 Nov. 1992 at Jinxiu. C:C-195.

Laxmidevipeta (= Laxmideirpet), Mulug Taluk, Warangal District; *Andhra Pradesh*, INDIA; 18°18′N, 79°58′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18). A:I-120.

Ledhan hla. See Lethan Hka.

Leibo; *Sichuan*, CHINA; 28°15′N, 103°34′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-142.

Lema Islands. See Dangan Dao.

Lena Island. See Dangan Dao.

Leshan (= Kia-ting), mountains 30 mi southwest

of, 2900 ft (= 880 m); *Sichuan*, CHINA; ca. 29°28′N, 103°18′E; collected 6 Feb. 1911 by M. P. Anderson; BM(NH), 1. C:C-139.

Lethan Hka, Maymyo F. D., 300 ft (= 90 m); *Mandalay*, MYANMAR (= BURMA); ca. 22°00′N, 96°30′E; collected 22 Dec. 1935 by H. C. Smith; BM(NH), 1. B:M-21.

Le Thuy. See Xuan Ninh.

Lhasa. See CHINA.

Lhunze Xian; *Xizang* (= *Tibet*), CHINA; ca. 28°30′N, 92°25′E; observed 1979–1982 by Zhang Cizu, Director, Shanghai Zoo (pers. comm., 18 Oct. 1985). B:C-4.

Liancheng Xian; *Fujian*, CHINA; ca. 25°47′N, 116°48′E; reported Aug. 1982 by Zheng Xueqing (1984, p. 146). C:C-90.

Liangdang; *Gansu*, CHINA; 33°56′N, 106°12′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-16.

Liangping; *Guangdong*, CHINA; 24°22′N, 114°30′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-96.

Lian Xian. See Lianzhou.

Lianzhou, Lian Xian; *Guangdong*, CHINA; 24°48′N, 112°25′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-201.

Libo; *Guizhou*, CHINA; 25°25′N, 107°53′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-175.

Lijiang; *Yunnan*, CHINA; 26°48′N, 100°16′E; reported before 1998 (Zhang et al., 1997, p. 58). B:C-45.

Lina. See Dangan Dao.

Lincang Prefecture; *Yunnan*, CHINA; ca. 23°54′N, 100°02′E; immunological survey conducted before 1996 by Duan Xingsheng, Liu Yuanwei, Wu Jing, Dao Weiying, and Liu Jianghai (1995, p. 411). B:C-69.

Lingchuan, southeast of, 900–1400 m; *Shanxi*, CHINA; ca. 35°38′N, 113°28′E; observed 1985–1994 by Zhu Jun, Zhao Yishan, and Fan Longsuo (1995, p. 134). C:C-7.

Lingtin Island. See Neilingding Dao.

Lingjun. See Longjun.

Lingrui. See Longrui.

Linh Thong, Dinh Hoa; *Bac Thai*, VIETNAM; 22°00′N, 105°42′E; collected 22 June 1967 by Truong Van La; ZMVNU, 2 (skins only). C:V-10.

Lintin Dao. See Neilingding Dao.

Linwan Shan Water Regulation Forest Reserve; *Guangxi*, CHINA; 22°25′N, 109°55′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 129; letter, Aug. 1996). C:C-215.

Li Shan National Nature Reserve, 700–1500 m; *Shanxi*, CHINA; ca. 35°22′N, 111°59′E; observed 1985–1994 by Zhu Jun, Zhao Yishan, and Fan Longsuo (1995, p. 134). C:C-3.

Litang-Batang; *Sichuan*, CHINA; ca. 30°00′N, 100°00′E; reported 23 Aug. 1877 by local residents (Gill 1883, p. 212). B:C-31.

Liukou, Qimen Xian, 300 m; *Anhui*, CHINA; ca. 29°55′N, 117°30′E; observed 1973–1986 by Xiong Chenpei (Wada et al., 1986, p. 83). C:C-48.

Liukou, Xiuning Xian, 400 m; *Anhui*, CHINA; 29°34′N, 117°49′E; observed 1973–1986 by Xiong Chenpei (Wada et al., 1986, p. 83). C:C-63.

Liulipenshan; Hebei CHINA; ca. 40°24′N, 117°30′E; reported fall 1987 by local hunters (Zhang et al., 1989, p. 380). C:C-1.

Liulipenshan, southern slope; Hebei CHINA; ca. 40°24′N, 117°30′E; reported 1985–1986 by local resident Wang Chaori (Zhang et al., 1989, p. 379). C:C-1.

Liuzhai vicinity, Nandan Xian; *Guangxi*, CHINA; ca. 25°18′N, 107°24′E; collected June 1992 by local farmer (Lu Gwangyan, manager of local products station, pers. comm., 27 Oct. 1992); skeleton examined 27 Oct. 1992 at Liuzhai. C:C-174.

Lofau. See Luofu Shan.

Lolab, 7500 ft (= 2300 m); *Jammu & Kashmir*, INDIA; ca. 34°30′N, 74°35′E; collected 8–9 Sept. 1891 by W. L. Abbott (True, 1894, p. 3; Blanford, 1898, p. 361); USNM, 5 including holotype of *Macacus rhesus villosus*). A:I-1.

Lolab Valley; *Jammu & Kashmir*, INDIA; ca. 34°30′N, 74°35′E; collected 11 Feb. 1911 by W. L. Abbott; USNM, 1. A:I-1.

Longan, Xiangshui District, Longzhou Xian; *Guangxi*, CHINA; ca. 22°24′N, 107°10′E; collected Dec. 1980 by Wu Mingchuan (pers. comm., 27 Nov. 1992); FDCG, 1 (skin with skull inside). C:C-226.

Longchi, Dahe District, Xixiang Xian, 1000–1500 m; *Shaanxi*, CHINA; 32°42′N, 107°28′E; observed June–July 1966 by Chen Fugan, Northwest University, Xi'an (pers. comm., 14 Oct. 1985). C:C-35.

Longgang Nature Reserve; *Guangxi*, CHINA; ca. 22°23′N, 106°53′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 126; letter, Aug. 1996). C:C-227.

Longhua Water Regulation Forest Reserve; *Guangxi*, CHINA; ca. 23°17′N, 105°34′E; observed 1976, 1986, and 1993 by Liu Wanfu and

Wei Zhenyi (1995, p. 128; letter, Aug. 1996). C:C-164.

Longhu Shan Nature Reserve, 490 m; *Guangxi*, CHINA; 22°42′N, 107°30′E; observed 1976, 1986, 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 127; letter, Aug. 1996). Observed 1988–1990 by Feng Min, Jiang Haisheng, and Wang Jun (1997, p. 27). C:C-225.

Longjun (= Lingjun) Hsienmu Reserve; *Guangxi*, CHINA; ca. 23°14′N, 107°54′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 129; letter, Aug. 1996). C:C-222.

Longrui (= Lingrui) Nature Reserve; *Guangxi*, CHINA; ca. 22°28′N, 107°12′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 126; letter, Aug. 1996). C:C-226.

Loshan. See Leshan.

Longsheng; *Guangxi*, CHINA; 25°48′N, 110°00′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-185.

Longxi (prefecture); Fujian, CHINA; ca. 24°31′N, 117°40′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-93.

Longyan Xian; *Fujian*, CHINA; ca. 25°11′N, 117°00′E; reported Oct. 1982 by Zheng Xueqing (1984, p. 146). C:C-92.

Louangphrabang, downstream; *Louangphrabang*, LAOS; ca. 19°52′N, 102°08′E; reported before 1964 by J. Deuve and M. Deuve (1963, p. 59). B:L-3.

Lower Bazar. See Simla.

Lu. See Kongbo.

Luang-Prabang. See Louangphrabang.

Lüchun; *Yunnan*, CHINA; 23°19′N, 102°10′E; reported before 1998 (Zhang et al., 1997, p. 58). B:C-76.

Lucknow vicinity; *Uttar Pradesh*, INDIA; ca. 26°51′N, 80°55′E; captured in 1938 by C. R. Carpenter (Rawlins & Kessler, 1986b, pp. 17, 21). Observed Sept. 1959–Feb. 1960 by C. H. Southwick, M. A. Beg, and M. R. Siddiqi (1961a, p. 543). Blood samples obtained 16–27 Apr. 1964 by K. V. Shah and C. H. Southwick (1965, p. 489). Reported ca. 1971 by D. Weinman (1974, p. 345). A:I-66.

Lucknow-Faizabad, highway between; *Uttar Pradesh*, INDIA; ca. 26°50′N, 81°30′E; observed Sept. 1959–June 1960 by C. H. Southwick, M. A. Beg, and M. R. Siddiqi (1961b, p. 702). Observed 24–25 Oct. 1964 by C. H. Southwick, R. K. Lahiri, M. Bertrand, D. Lindburg, and P. Jay (Southwick & M. R. Siddiqi, 1966, p. 306). A:I-65.

Lucknow-Sitapur, highway between; *Uttar Pradesh*, INDIA; ca. 27°10′N, 80°50′E; observed 21–29 Oct. 1964 by C. H. Southwick, D. Lindburg, M. Neville, P. Jay, M. R. Siddiqi, and R. P. Mukherjee (Southwick & M. R. Siddiqi, 1966, p. 306). Observed 1964–65 by R. P. Mukherjee and G. D. Mukherjee (1972, p. 67). A: I-58.

Luia, Chaibasa vicinity, Singhbhum District, 1000 ft (= 300 m); *Bihar*, INDIA; 22°23′N, 85°32′E; collected 1 Aug. 1914 by C. A. Crump (in Wroughton, 1915b, p. 99); BM (NH), 3. A-I:105.

Lungli vicinity, southeast of Liuzhai, Nandan Xian; *Guangxi*, CHINA; ca. 25°17′N, 107°25′E; collected Dec. 1991 by He Kean (pers. comm., 27 Oct. 1992); skin and skeleton examined 27 Oct. 1992 at Lungli. C:C-174

Lunpuriagaon, *Assam*, INDIA; ca. 26°57′N, 94°47′E; reported 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 31). B:I-25.

Luocheng; *Guangxi*, CHINA; 24°47′N, 108°54′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-179.

Luofu Shan, 800–1100 m; *Guangdong*, CHINA; ca. 23°17′N, 114°03′E; reported 1908–1921 by R. Mell (1922, pp. 10, 11). C:C-208.

Luquan; *Yunnan*, CHINA; 25°35′N, 102°30′E; reported before 1998 (Zhang et al., 1997, p. 58). B:C-50.

Luyuan, Taihe Xian; *Jiangxi*, CHINA; ca. 26°50′N, 114°40′E; reported Oct. 1979 by local residents (Liu Zhenhe, SCIEA, pers. comm., 25 Nov. 1985). C:C-104.

Ly Bon, Bao Lac District; *Cao Bang*, VIETNAM; ca. 22°57′N, 105°41′E; collected 5 June 1965 by unknown collector (Dao, 1985, p. 38); IEBR, 4 (3 skins only, 1 skull only [possibly belongs with one of the skins]). C:V-7.

Machayara Game Reserve; *Azad Kashmir*, PAKISTAN; ca. 34°00′N, 73°35′E; reported before 1984 by M. Nawaz (1983, p. 6). A:P-12.

Madaripur Township; *Madaripur*, BANGLADESH; ca. 23°10′N, 90°12′E; reported before 1986 by M. A. R. Khan (1981, p. 13; 1985, p. 31). B:Ba-25.

Madaya, Maymyo Reserve; *Mandalay*, MYANMAR (= BURMA); 22°13′N, 96°07′E; collected 15 Feb. 1936 by P. F. Garthwaite; BM (NH), 1 (skin only). B:M-22.

Madhupur, ca. 100 km west of; *Natore*, BANGLADESH; ca. 24°30′N, 89°00′E; tentatively reported July–Nov. 1976 by K. M. Green (1978, p. 146). B:Ba-5.

Madhupur National Park; *Tangail*, BANGLADESH; ca. 24°45′N, 90°08′E; observed July–

Nov. 1976 by K. M. Green (1978, p. 154). Observed Dec. 1977–July 1978 by M. A. Islam and K. Z. Husain (1982, p. 157). Observed early in 1980 by S. P. Gittins and A. W. Akonda (1982, p. 278). Observed before 1982 by M. A. R. Khan (1981, p. 13). Observed Feb. 1990–June 1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, p. 76). B:Ba-7.

Madhpur National Park, southern portion; *Tangail*, BANGLADESH; ca. 24°30′N, 90°10′E; observed Sept.–Dec. 1986 and Dec. 1987–Dec. 1988 by C. B. Stanford (1991, p. 17; 1992, p. 188). B:Ba-8.

Magi, Banswada Taluk, Nizamabad District; *Andhra Pradesh*, INDIA; 18°12′N, 77°55′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18). A:I-117.

Mahabali Temple. See Imphal, Mahabali Temple.

Mahal, 2–5 km northwest of, Dangs District, 200–275 m, *Gujarat*, INDIA; 20°56′N, 73°37′E; observed 12 Mar. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 466). A:I-99.

Maiskhal Island; *Cox's Bazar*, BANGLADESH; ca. 21°35′N, 91°55′E; reported early in 1980 by S. P. Gittins and A. W. Akonda (1982, p. 278). B:Ba-38.

Maizhokunggar Xian; *Xizhang* (= *Tibet*), CHINA; ca. 29°50′N, 91°45′E; observed 1979–1982 by Zhang Cizu, Director, Shanghai Zoo (pers. comm., 18 Oct. 1985). B:C-2.

Makalu-Barun Conservation Area. See Sankhuwa Khola.

Makehe Plantation, 3100–4000 m; *Qinghai*, CHINA; ca. 33°00′N, 96°20′E; purchased ca. 1982 at Baima Xian by Liao Yianfa, Director of Xining Zoo (pers. comm., 6 Oct. 1985); captive observed 6 Oct. 1985. B:C-16.

Makhena, near Anupshahr; *Uttar Pradesh*, INDIA; ca. 28°22′N, 78°16′E; reported ca. 1980 by C. H. Southwick and M. F. Siddiqi (1984, p. 559). A:I-49.

Makkimarigudem (= Makkinavarigudem), Chintalapudi Taluk, West Godavari District; *Andhra Pradesh*, INDIA; 17°09′N, 81°05′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 19). A:I-137.

Malakand. See Bar Chanrai Hill.

Malipura. See Khair, Tahsil.

Malkangiri (= Malkanagiri), Jeypore Agency, Visakhapatnam vicinity; *Orissa*, INDIA; 18°21′N, 81°54′E; collected 28 Aug. 1927 by A. V. Sundaram and A. H. Bishop; BM(NH), 1 (skin only). A:I-110.

Mall. See Simla.

Mallur, Banswada Taluk, Nizamabad District; *Andhra Pradesh*, INDIA; 18°16′N, 77°53′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18). A:I-117.

Malua, Seoni Tank; *Madhya Pradesh*, INDIA; ca. 21°00′N, 79°59′E; collected before 1974 by S. W. Prater; BNHS, 1 (skin only). A:I-103.

Maluling; *Xizang* (= *Tibet*), CHINA; ca. 32°40′N, 97°20′E; reported before 1998 (Zhang et al., 1997, p. 58). B:C-18.

Mamsam Falls. See Mansam Falls.

Manali; *Himachal Pradesh*, INDIA; ca. 32°20′N, 77°05′E; reported 1978–1980 by A. J. Gaston, P. J. Garson, and M. L. Hunter, Jr. (1983, p 300). A:I-13.

Manas. See Royal Manas National Park.

Manas National Park; *Assam*, INDIA; ca. 26°40′N, 90°55′E; reported before 1997 by K. K. Gurung and R. Singh (1996, p. 104). B:I-supplementary.

Mandagal, northwest of; *Konarha*, AFGHANISTAN; ca. 35°35′N, 71°15′E; reported before 1972 by A. Puget (1971, p. 201). A:A-1.

Mandal. See Kedarnath Sanctuary.

Manghe Nature Reserve, 680–1000 m; *Shanxi*, CHINA; ca. 35°15′N, 112°27′E; observed 1985–1994 by Zhu Jun, Zhao Yishan, and Fan Longsuo (1995, p. 134). C:C-4.

Mangpu, 3000 ft and 3500 ft (= 910 m and 1070 m); *West Bengal*, INDIA; 26°58′N, 88°24′E; collected 5 and 12 Dec. 1930 by H. Stevens; FMNH, 2. B:I-6.

Manipompla. See Munipamula.

Manipuri Tea Estate; *Sylhet*, BANGLADESH; not precisely located, 24°08′–24°50′N, 91°37′–92°17′E; observed Feb. 1990–June 1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, p. 76). Not mapped.

Manpa, Mengla Xian, 650–750 m; *Yunnan*, CHINA; ca. 21°40′N, 101°37′E; collected 14 May 1959 by Deng Xiangfu; KIZ, 2 (skulls only). Collected 19 Jan. and 8 May 1962 by Quan Guoqiang (pers. comm., 25 Aug. 1983); IZCAS, 2. B:C-85.

Mansam Falls, Nam Yao (river), 2000 ft (= 610 m); *Shan*, MYANMAR (= BURMA); 22°48′N, 97°32′E; collected 6 June 1913 by G. C. Shortridge (in Ryley, 1914, p. 713); BM(NH), 2 (including 1 skin only); BNHS, 3. B:M-19.

Mansar Patwar. See Surinsar.

Mao'er Shan Nature Reserve; *Guangxi*, CHINA; ca. 25°53′N, 110°28′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 126; letter, Aug. 1996). C:C-189.

Maojie Bird Reserve; *Guangxi*, CHINA; ca. 24°28′N, 104°35′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 129; letter, Aug. 1996). C:C-154.

Maowen; *Sichuan*, CHINA; 31°41′N, 103°52′E; tentatively reported 1914–1916 by H. Weigold (1924, p. 71). C:C-25.

Marco River. See Golog Zangzu Zishizhou.

Mardan. See Pajja Hill.

Margalla Hills National Park; *Federal Capital Territory*, PAKISTAN; 33°48′N, 73°10′E; reported ca. 1975 by S. J. Goldstein and A. F. Richard (1989, p. 563). Reported before 1978 by T. J. Roberts (1977, p. 87). Reported before 1984 by M. Nawaz (1983, p. 2). A:P-11.

Margherita, Lakhimpur District, 200 ft (= 60 m); *Arunachal Pradesh*, INDIA; 27°17′N, 95°41′E; collected 14 Nov. 1919 by H. W. Wells (Hinton & Lindsay, 1926, p. 385); ZSI, 1 (skin only). B:I-29.

Marot (= Maroth), Nagaur District; *Rajasthan*, INDIA; 27°05′N, 75°05′E; observed June 1971–June 1972 by P. R. Ojha (1974, p. 163). Observed 1975–1980 by P. K. Seth and S. Seth (1983, p. 63). A:I-77.

Mar Qu. See Golog Zangzu Zishizhou.

Mat, Phu; *Nghe An*, VIETNAM; 18°38′–20°00′N, 103°53′–105°12′E; observed ca. 1990–1995 by L. K. Lippold (1995, p. 198; cf. Cao, 1995, p. 182). Not mapped.

Mathura; *Uttar Pradesh*, INDIA; 27°30′N, 77°41′E; observed Sept. 1959–Feb. 1960 by C. H. Southwick, M. A. Beg, and M. R. Siddiqi (1961a, p. 543). Observed 1964–1965 by C. H. Southwick and M. R. Siddiqi 1966, p. 309). A: I-71.

Mathura District (= Muttra); *Uttar Pradesh*, INDIA; 27°15′–28°00′N, 77°15′–77°50′E; laboratory animals obtained in 1891 by W. Heape (1897, p. 135). Not mapped.

Matlab Bazar; *Chandpur*, BANGLADESH; 23°20′N, 90°43′E; reported before 1986 by M. A. R. Khan (1981, p. 13; 1985. p. 31). B:Ba-28.

Matlab, southeast of; *Noakhali* BANGLADESH; ca. 23°00′N, 91°00′E; tentatively reported July–Nov. 1976 by K. M. Green (1978, p. 146). B.Ba-30.

Maungkan, east bank of Chindwin River; *Sagaing*, MYANMAR (= BURMA); 25°05′N, 95°02′E; collected 20 Mar. 1935 by H. C. Raven and R. C. Morris (Raven in Carter, 1943, p. 100; Morris, 1936, p. 667); AMNH, 1. B:M-13.

Maure, near, 1.6 km north of Jamduar; *Assam*, INDIA; ca. 26°44′N, 89°53′E; observed 19 Nov.–1 Dec. 1959 by E. P. Gee (1961, p. 6). B: I-10.

Mautschou. See Maowen.

Maymo F. D. See Lethan Hka.

Maymyo (= Maymo), 800 m; *Mandalay*, MYANMAR (= BURMA); 22°02′ N, 96°28′E; collected 3 Dec. 1937 by G. Heinrich; AMNH, 1. B: M-21.

Maymyo Reserve. See Madaya.

Mêdog Xian; *Xizang* (= Tibet), CHINA; ca. 29°15′N, 95°15′E; observed 1979–1982 by Zhang Cizu, Director, Shanghai Zoo (pers. comm. 18 Oct. 1985). B:C-13.

Meerut District; *Uttar Pradesh*, INDIA; ca. 28°55′N, 77°41′E; observed 1981–1983 by P. K. Seth, S. Seth, G. L. Reddy, and P. K. Chopra (1992, p. 62), A:I-35.

Meetha Pur, ca. 10 km from Tughlaqabad; *Delhi*, INDIA; ca. 28°30′N, 77°15′E; reported Aug. 1989 by I. Malik and R. L. Johnson (1991, p. 63; 1994, p. 237). A:I-41.

Meherpur; *Meherpur*, BANGLADESH; 23°46′N, 88°38′E; reported before 1982 by M. A. R. Khan (1981, p. 13). B:Ba-17.

Meigu; *Sichuan*, CHINA; 28°20′N, 103°04′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-141.

Meihua Shan (= Meihaushan); *Fujian*, CHINA; ca. 25°15′N, 116°45′E; reported Nov. 1983 by Zheng Xueqing (1984, p. 145). Reported before 1986 by Tan Bangjie (1985, P. 73). C: C-91.

Meitan, near; *Guizhou*, CHINA; ca. 27°40′N, 107°30′E; captive purchased 7 Nov. 1960 by Quan Guoqiang (pers. comm. 25 Aug. 1983); IZCAS, 1 C:C-128.

Mekong River, 90 km above Viangchan; *Vientiane*, LAOS; 18°05′N, 101°57′E; collected 7 July 1924 by F. R. Wulsin (field catalog and map, USNM archives); USNM, 1. B:L-5.

Mellavagu (= Melavagu), Ipur Taluk, Guntur District; *Andhra Pradesh*, INDIA; 16°20′N, 79°45′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 19). A:I-147.

Meng-ban; *Yunnan*, CHINA; ca. 21°45′N, 100°10′E; collected 30 May 1958 by Ye Zongyao (Bannikov, 1958, p. 68; Kao et al., 1962, p. 188; Quan Guoqiang, pers. comm., 25 Aug. 1983). IZCAS, 1. B:C-80.

Menghai; *Yunnan*, CHINA; 21°58′N, 100°28′E; collected 27 Nov. 1957 and 17 Apr. 1958 by Ye Zongyao (Bannikov, 1958, p. 68; Kao et al., 1962, p. 188); IZCAS, 2 (1 skin only; 1 skull only

[external measurements recorded on skull tag]). B:C-81.

Menghun; *Yunnan*, CHINA; 21°50′N, 100°23′E; reported before 1998 (Zhang et al., 1997, p. 58). B:C-81.

Mengla Xian, 640 m and 730 m; *Yunnan*, CHINA; 21°–22°N, 101°–102°E; collected in 1959 by unknown collector; KIZ, 3 (2 skins only, 1 skull only). Collected 30 Oct. 1961 by Li Zhixiang; KIZ, 1. Not mapped.

Menglong; *Yunnan*, CHINA; 21°36′N, 100°40′E; reported befored 1998 (Zhang et al., 1997, p. 58). B:C-82.

Menglun, Mengla Xian, 740 m; *Yunnan*, CHINA; 21°55′N, 101°15′E; collected 8 May 1959 by Deng Xiangfu (Wang Yingxiang, pers. comm., 29 Aug. 1983); KIZ, 1 (skin only). Collected in 1961 by Yang Lan (Wang Yingxiang, pers. comm., 29 Aug. 1983); KIZ, 1 (skin only). B:C-84.

Mengyang; *Yunnan*, CHINA; ca. 22°00′N, 100°50′E; collected 10 and 12 Apr. 1957 and 18 Oct. 1958 by Ye Zongyao (Bannikov, 1958, p. 68; Kao et al., 1962, p. 188; Quan Guoqiang, pers. comm. 25 Aug. 1983); IZCAS, 3. B:C-83.

Me Ping rapids. See Kaeng Mae Hat.

Mesogarh; *Assam*, INDIA; ca. 26°58′N, 94°41′E; reported 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 31). B:I-25.

Meteka; *Assam*, INDIA; ca. 26°58′N, 94°39′E; observed 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 32). B:I-25.

Mg. Khua. See Ou, Nam, between Muang khoua and Muang Ngoy.

Mg. Ngoi. See Ou, Nam, between Muang Khoua and Muang Ngoy.

Midwest Sichuan. See Sichuan, west-central.

Mihouling, Ledong Xian, 700–800 m; Hainan Dao; *Hainan*, CHINA; 18°55′N, 109°08′E; purchased 5 May 1964 by Liu Zhenhe, SCIEA (pers. comm., 26 Nov. 1985); SCIEA, 1. C:C-234.

Mikir Hills, *Assam*, INDIA; ca. 26°10′N, 93°30′E; reported Dec. 1972–Feb. 1973 by R. L. Tilson (1983, p. 399). B:I-33.

Mile; *Yunnan*, CHINA; 24°24′N, 103°27′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-148.

Minglang; *Yunnan*, CHINA; 23°53′N, 99°11′E; reported before 1998 (Zhang et al., 1997, p. 58). B:C-66.

Mingun, near Sagaing, 250 ft (= 70 m); *Sagaing*, MYANMAR (= BURMA); 22°03′N, 96°01′E; collected 12 July 1913 by G. C. Shortridge (in Wroughton, 1915a, p. 461); BM(NH), 1. B:M-23.

Mintal. See Wassuland.

Mintal, ob. See Maowen.

Mirkhani (= Mirkandi), 4000 ft (= 1200 m); *North-West Frontier*, PAKSITAN; 35°28′N, 71°44′E; observed before 1902 by Capt. B. E. M. Gurdon (McMahon, 1901a, p. 4). A:P-1.

Misajan; *Assam*, INDIA; ca. 26°52′N, 94°39′E; reported 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 31). B:I-25.

Mishmi Hills. See Dening.

Miyi; *Sichuan*, CHINA; 26°50′N, 102°03′E; reported before 1998 (Zhang et al., 1997, p. 58). B:C-48.

Miwan, Taishan Xian, Shangchuan Dao, <200 m; *Guangdong*, CHINA; 21°37′N, 112°45′E; collected 19 Apr. 1981 by Liu Zhenhe and Xu Longhuei (Liu Zhenhe, SCIEA, pers. comm., 26 Nov. 1985); SCIEA, 1. C:C-213.

Moduri; *Assam*, INDIA; ca. 26°55′N, 94°44′E; reported 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 31). B:I-25.

Moenjo Daro: *Sind*, PAKISTAN; 27°19′N, 68°07′E; possible occurrence ca. 4000 B.P. indicated by prehistoric statuettes (Mackay, 1931, p. 349; Iyer, 1977, p. 15). Not mapped.

Mohan (= Mohand); *Uttar Pradesh*, INDIA; 30°11′N, 77°54′E; reported 1964–1966 by D. G. Lindburg (1977a, p. 268). A:I-27.

Mohenjodero. See Moenjo Daro.

Mojiang Xian; *Yunnan*, CHINA; ca. 23°25′N, 101°44′E; immunological survey conducted before 1996 by Duan Xingsheng, Liu Yuanwei, Wu Jing, Dao Weiying, and Liu Jianghai (1995, p. 411). B:C-75.

Moklok, east bank of Chindwin River; *Sagaing*, MYANMAR (= BURMA); ca. 25°37′N, 95°25′E; collected 16 Mar. 1935 by H. C. Raven (in Carter, 1943, p. 100; Morris, 1936, p. 666); AMNH, 1. B:M-10.

Mollur. See Mallur.

Molta; *Uttar Pradesh*, INDIA; ca. 30°00′N, 79°00′E; observed 1955–1957 by G. A. von Maydell (Oboussier & von Maydell, 1960, p. 143). A:I-30.

Momien. See Tengchong.

Mom Ray (= Mon Ray) Nature Reserve; *Kon Tum*, VIETNAM; ca. 14°27′N, 107°45′E; reported ca. 1990–1995 by L. K. Lippold (1995, p. 200). C:V-38.

Mong Moen. See Muong Muon.

Mong Moun. See Muong Pon.

Monkey Bridge. See Lucknow vicinity.

Monkey hill, <10 mi (<16 km) south of Jinggangshan; *Jiangxi*, CHINA; ca. 26°30′N,

114°10′E; reported ca. 1985 by Tan Bangjie (1985, p. 73). Report unverified; *M. thibetana* only macaque verified at this locality (Li Xiongshan, Jinggangshan Nature Reserve Bureau, pers. comm., 4 Nov. 1985; Liu Zhenhe, SCIEA, pers. comm., 25 Nov. 1985). Not mapped.

Mon Ray Nature Reserve. See Mom Ray Nature Reserve.

Moradabad vicinity; *Uttar Pradesh*, INDIA; ca. 28°50′N, 78°47′E; autopsied ca. 1966 by K. K. Chawla, C. D. S. Murthy, R. N. Chakravarti, and P. N. Chhuttani (1967, p. 85). A:I-50.

Morang region; *Morang*, NEPAL; ca. 26°30′N, 87°30′E; reported 1920–1921 by N. A. Baptista (in Hinton & Fry, 1923, p. 403). B:N-4.

Morit forest. See Kokkoaing.

Moshemien; *Sichuan*, CHINA; ca. 30°00′N, 102°00′E; reported 24 June–7 July 1929 by local residents (Stevens, 1934, p. 132). B:C-27.

Motianling, Debao Xian; *Guangxi*, CHINA; ca. 23°20′N, 106°37′E; collected ca. Oct. 1979 by unknown collector (Quan Guoqiang, pers. comm., 13 Dec. 1985); FDCG, 1 (mounted skin with skull inside; specimen not seen). C:C-167.

Moung Boum. See Muong Boum.

Moung Mouen. See Muong Muon.

Moung-moun. See Muong Moun.

Mount Everest. See Sagarmatha.

Mount Omei. See Emei Shan.

M. R. G. High School. See Dhaka.

Mt. Wuchi. See Wuzhi Shan.

Muang Khoua. See Ou, Nam, between Muang Khoua and Muang Ngoy.

Muang Ngoy. See Ou, Nam, between Muang Khoua and Muang Ngoy.

Muang Pakxan; *Vientiane*, LAOS; ca. 18°22′N, 103°39′E; reported before 1964 by J. Deuve and M. Deuve (1963, p. 59). C:L-2.

Muang Thateng, Plateau des Bolovens; *Saravan*, LAOS; 15°26′N, 106°23′E; purchased 29 Jan. and 13 Feb. 1932 by T. D. Carter (Legendre, 1932, p. 495; 1936, p. 251; Fooden, 1997, pp. 227, 229); ANSP, 5. C:L-3.

Mudhalaparava, Krishna District 120 m; *Andhra Pradesh*, INDIA; 16°56′N, 80°45′E; observed 14 May 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 468). A:I-140.

Mudigonda (= Mudukonda), Khammam Taluk, Khammam District; *Andhra Pradesh*, INDIA; 17°10′N, 80°04′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18). A:I-132.

Muli; *Sichuan*, CHINA; 27°50′N, 101°15′E; reported 9 Apr. 1929 by H. Stevens (1934, p. 132). Tissue samples obtained ca. 1991 by Zhang Yaping and Shi Liming (1993b, p. 589). Reported before 1992 by Jiang Xuelong, Wang Yingxiang, and Ma Shilai (1991, p. 243). B:C-39.

Mulug (= Mulugu), Gajwel Taluk, Medak District; *Andhra Pradesh*, INDIA; 17°45′N, 78°38′E; reported Feb. 1977–July 1980 by G.U. Kurup (1984, p. 58; 1992, p. 18). A:I-123.

Mulun Nature Reserve; *Guangxi*, CHINA; ca. 25°08′N, 107°50′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 127; letter, Aug. 1996). C:C-177.

Mumbai (= Bombay), Raj Bhavan compound; *Maharashtra*, INDIA; 18°56′N, 72°48′E; population atrificially introduced (Serrao & Amladi, 1979, pp. 29, 32). Observed Apr.–May 1973 by J. Fooden. Not mapped.

Municipal Corporation Builiding. See Aligarh.

Munipamula, Ramannapet Taluk, Nalgonda District; *Andhra Pradesh*, INDIA; 17°19′N, 79°09′E; reported Feb. 1977–July 1980 by G.U. Kurup (1984, p. 58; 1992, p. 18). A:I-128.

Muong Boum, Tonkin region; *Lai Chau*, VIETNAM; 22°23′N, 102°49′E; collected 27 Mar. 1929 by R. W. Hendee (Bangs & Van Tyne, 1931, p. 37; Coolidge, 1933, p. 94); FMNH, 1. B:V-1.

Muong Cha; *Lai Chau*, VIETNAM; 21°58′N, 102°51′E; collected 27 Apr. 1963 by unknown collector (Dao, 1985, p. 147); museum unknown (not seen), B:V-3.

Muong Mo; *Lai Chau*, VIETNAM; 22°13′N, 102°55′E; captives acquired 12–20 Mar. 1929 by H. J. Coolidge, Jr., and R. W. Hendee (Coolidge, 1933, pp. 86, 216; Bangs & Van Tyne, 1931, p. 35). B:V-2.

Muong Moun, Tonkin region; *Lai Chau*, VIETNAM; 21°42′N, 103°21′E; collected 15 Mar. 1929 by R. E. Wheeler (Bangs & Van Tyne, 1931, p. 34); FMNH, 1. C:V-3.

Muong Muon, Tonkin region; *Lai Chau*, VIETNAM; 21°40′N, 103°04′E; captive purchased Nov. 1931 by T. D. Carter (Legendre, 1936, p. 125); died in zoo 15 June 1932; AMNH, 1. C:V-2.

Muong Pon (= Muong Poun), Tonkin region; *Lai Chau*, VIETNAM; 21°33′N, 103°01′E; collected 18 Nov. 1931 by T. D. Carter (Legendre, 1936, p. 125); AMNH, 1. C:V-2.

Muong Son. See Huong Son.

Murree, outskirts; *Punjab*, PAKISTAN; 33°54′N, 73°22′E; reported in 1964 by T. J. Roberts (1977, p. 87). A:P-12.

Mussoorie (= Mussooree) vicinity; *Uttar Pradesh*, INDIA; ca. 30°27′N, 78°05′E; reported before 1866 by T. Hutton (1865, p. xiii [misidentified as *Inuus pelops*]; cf. Fooden, 1982a, p. 2). A:I-27.

Mustapur, 0.5 km east of, Nizamabad District, 560 m; *Andhra Pradesh*, INDIA; 18°17′N, 78°10′E; observed 15 Apr. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 467). A:I-118.

Muttagudem, Krishna District, 80 m; *Andhra Pradesh*, INDIA; 17°07′N, 80°37′E; observed 14 May 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 467). A:I-136.

Muttra. See Mathura.

MYANMAR (= BURMA), eastern; 20°–24°N, 97°–101°E; tissue samples obtained ca. 1991 by Zhang Yaping and Shi Liming (1993b, p. 589). Not mapped.

MYANMAR (= BURMA). upper; *Kachin*, MYANMAR; 26°00′–26°40′N, 97°50′–97°55′E; collected ca. 1939 by R. Kaulback (Pocock, 1941, p. v); BM(NH), 1 (skull only). Not mapped (see B:M-1).

Myitkyina; *Kachin*, MYANMAR (= BURMA); 25°23′N, 97°24′E; captive purchased June–Dec. 1945 by M. L. Roonwal (1950, p. 16 [misidentified as *M. assamensis*]). B:M-5.

Mymensingh, northern, BANGLADESH; ca. 25°10′N, 90°30′E; reported early in 1980 by S. P. Gittins and A. W. Akonda (1982, p. 278). B: Ba-9.

Na chaka. See Yajiang.

Nachuka. See Yajiang.

Nada (= Nodoa), Hainan Dao; *Hainan*, CHINA; 19°31′N, 109°33′E; collected 9–28 Jan. and 19 Apr. 1923 by C. H. Pope (1932b, p. 481; 1935, p. 498); AMNH, 4; FMNH, 1. C:C-229.

Nagarjunakonda Valley. See Siddeldar Hill.

Nagarkot (= Nagarcot), 8000 ft (= 2400 m); *Bagmati*, NEPAL; 27°42′N, 85°31′E; collected 15 Oct. 1920 by R. L. Kennion (Hinton & Fry, 1923, p. 403); BM(NH), 2. A:N-12.

Nagchuka. See Yajiang.

Nagorhgena; *Assam*, INDIA; ca. 24°17′N, 92°30′E; observed 21–25 Mar. 1986 by A. Choudhury (1983, p. 14; 1989, p. 491; [1991a], p. 124). B:I-39.

Nagpur, 300 m; *Maharashtra*, INDIA; 21°10′N, 79°05′E; observed 30 Mar. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 466). A: I-102.

Nai Basti. See Khair, Tahsil.

Naini Tal, Bhowal area, Kumaon region; *Uttar Pradesh*, INDIA; ca. 29°23′N, 79°27′E; observed Sept. 1959–June 1960 by C. H. Southwick, M. A. Beg, and M. R. Siddiqi (1961b, p. 703). Parasitological study conducted ca. 1980 by S. N. Arya (1981, p. 261). A:I-32.

Naini Tal District; *Uttar Pradesh*, INDIA; 28°45′–29°35′N, 78°40′–80°10′E; observed 1981–1983 by P. K. Seth, S. Seth, G. L. Reddy, and P. K. Chopra (1992, p. 62). Not mapped.

Nam Co (= Tengri-Nor); Xizang, CHINA; 30°42′N, 90°35′E; erroneous record (Elliot, 1913, p. 197; cf. Milne-Edwards, 1892, p. 670). Not mapped.

Nam Fong. See Nanfeng.

Nam hou. See Ou, Nam.

Nam miu. See Luofu Shan.

Nam Ngap, Luc Yen District, *Yen Bai*, VIETNAM; ca. 22°07′N, 104°47′E; collected Dec. 1971 and date unknown by unknown collector; IEBR, 2 (skulls only). C:V-4.

Nam U. See Ou, Nam.

Nam Yao. See Mansam Falls.

Nam Yu. See Ou, Nam.

Nanau; *Uttar Pradesh*, INDIA; 27°48′N, 78°16′E; observed 1959–1975 by C. H. Southwick and M. F. Siddiqi (1977, p. 342). Observed Jan. 1990–Mar. 1991 by E. Imam and H. S. A. Yahya 1995, p. 2). A:I-69.

Nanchuan; *Sichuan*, CHINA; 29°07′N, 107°16′E; reported before 1992 by Jiang Xuelong, Wang Yingxiang, and Ma Shilai (1991, p. 244). C:C-133.

Nanding He (= Nanting River), Lincang District; *Yunnan*, CHINA; ca. 24°00′N, 99°44′E; reported before 1996 by Lan Daoying and Guo Guang (1995, p. 6). B:C-68.

Nandini Wildlife Sanctuary, Jammu District; *Jammu & Kashmir* INDIA; ca. 32°44′N, 74°52′E; reported before 1984 by B. K. Tikader (1983, p. 297). A:I-5.

Nanfeng (= Nam Fong) Shi; Hainan Dao; *Hainan*, CHINA; 19°24′N, 109°31′E; collected 23 Mar. and 14 May 1923 by C. H. Pope (1935, p. 498); AMNH, 1; MCZ, 1. C:C-229.

Nanglamora; *Assam*, INDIA; ca. 27°00′N, 94°46′E; reported 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 31). B:I-25.

Nangpoh. See Nongpoh.

Nang Pon. See Nongpoh.

Nang Xian; *Xizang* (= *Tibet*), CHINA; ca. 29°05′N, 93°05′E; observed 1979–1982 by Zhang Cizu, Director, Shanghai Zoo (pers. comm., 18 Oct. 1985). B:C-6.

Nanhua; *Yunnan*, CHINA; 25°13′N, 101°21′E; reported before 1998 (Zhang et al., 1997, p. 58).

Blood sample obtained before 1999 by Ding Bo, Zhang Yaping, and Hou Yidi (1998, p. 172). B:C-53.

Nanjian; *Yunnan*, CHINA; 25°04′N, 100°32′E; reported before 1998 (Zhang et al., 1997, p. 58). B:C-54.

Nanjiang; *Sichuan*, CHINA; 32°21′E; 106°50′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-33.

Nan Ling; *Guangdong*, CHINA; ca. 24°10′N, 112°00′E; reported 1980–1981 by Fu Tingzhang (1987, p. 37). C:C-198.

Nanning; *Guangxi*, CHINA; ca. 22°49′N, 108°19′E; captive purchased Jan. 1964 by unknown collector; KIZ, 1. C:C-220.

Nanping; *Sichuan*, CHINA; 33°14′N, 104°06′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-22.

Nantaleik Chaung. See Hisweht.

Nanting River. See Nanding He.

Nanwan, Xingcungang, Lingshui Xian, 100–200 m; Hainan Dao; *Hainan*, CHINA; 18°24′N, 109°59′E; captured in 1970 by Liu Zhenhe, SCIEA (pers. comm., 26 Nov. 1985); died in captivity 15 May 1976; SCIEA, 2. Reported before 1981 (Anonymous, 1980, p. 17). Observed before 1988 by Wang Zeng (1987, p. 39). Reported before 1989 by Tan Manni (1988, p. 14). C:C-239.

Nanwan Nature Reserve, Hainan Dao, 255 m; *Hainan*, CHINA; 18°23′N, 110°00′E; observed 1965–1989 by Jiang Haisheng, Liu Zhenhe, Zhang Yongzu, and C. Southwick (1991, p. 208; Southwick et al., 1991, p. 25; Jiang et al., 1994, p. 166). Observed 1988–1990 by Feng Min, Jiang Haisheng, and Wang Jun (1997, p. 27). Observed ca. 1991 by D. Manry (1991, p. 10). C:C-239.

Nanyaseik, 480 ft (= 145 m); *Kachin*, MYANMAR (= BURMA); ca. 25°37′N, 96°36′E; collected 7 and 11 Jan. 1935 by H. C. Raven (in Carter, 1943, p. 100; Morris, 1936, p. 648); AMNH, 4. B:M-6.

Naogaon; *Naogaon*, BANGLADESH; 24°47′N, 88°56′E; reported before 1982 by M. A. R. Khan (1981, p. 13). B:Ba-4.

Narasaraopet, 2 km northwest of, Guntur District, 75 m; *Andhra Pradesh*, INDIA; 16°14′N, 80°02′E; observed 9 May 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 468). A:I-145.

Narayanapur (= Narayanpur), Jangaon Taluk, Warangal District; *Andhra Pradesh*, INDIA; 17°44′N, 79°14′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18). A:I-122.

Narayanganj (= Narayangong); *Narayanganj*, BANGLADESH; 23°37′N, 90°30′E; reported before 1982 by M. A. R. Khan (1981, p. 13; 1985, p. 31). B:Ba-27.

Narbong, Darjeeling Disrtict, 2000 ft (= 600 m); *West Bengal*, INDIA; 26°51′N, 88°20′E; collected 11 Mar. 1915 by C. A. Crump (Wroughton, 1916b, p. 472); BM(NH), 1. B:I-6.

Narkanda, ca. 1 km north of; *Himachal Pradesh*, INDIA; ca. 31°17′N, 77°27′E; observed Aug. 1972–Feb. 1973 by K. Wada (1984, pp. 475, 483). A:I-17.

Narkanda, ca. 4 km south of; *Himachal Pradesh*, INDIA; ca. 31°14′N, 77°27′E; observed Aug. 1972–Feb. 1973 by K. Wada (1984, p. 475). A:I-17.

Narkanda, ca. 5 km north of; *Himachal Pradesh*, INDIA; ca. 31°18′N, 77°27′E; reported Aug. 1972–Feb. 1973 by K. Wada (1984, p. 475). A:I-17.

Narma. See Narva.

Narota-Bun, highway between; *Jammu & Kashmir*, INDIA; ca. 32°49′N, 74°55′E; observed before 1983 by Y. R. Malhotra and D. N. Sahi (1982, p. 27). A:I-5.

Narpuh Reserved Forest, Jaintia Hills; *Meghalaya*, INDIA; ca. 25°05′N, 92°20′E; observed ca. 1996 by A. Choudhury (1998, p. 8). B:I-18.

Narva, Banswada Taluk, Nizamabad District; *Andhra Pradesh*, INDIA; 18°14′N, 77°59′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18). A:I-117.

Nathia Gali; *North-West Frontier*, PAKISTAN; 34°04′N, 73°24′E; reported in 1964 by T. J. Roberts (1977, p. 87). A:P-12.

Nawabganj vicinity; *Nawabganj*, BANGLADESH; ca; 24°36′N, 88°17′E; reported before 1982 by M. A. R. Khan (1981, p. 13; 1985, p. 31). B:Ba-3.

Nawakot. See Trisuli Bazar.

Nazuo Water Regulation Forest Reserve; *Guangxi*, CHINA; ca. 24°12′N, 105°32′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 127; letter, Aug. 1996). C:C-162.

N'Changyang, 1500 ft (= 460 m); *Kachin*, MYANMAR (= BURMA); 25°50′N, 97°48′E; collected 4 and 19 July 1939 by R. Kaulback; BM(NH), 2 (including 1 skin only). B:M-3.

Neelum Valley; *Azad Kashmir*, PAKISTAN; ca. 34°20′N, 73°35′E; reported before 1978 by T. J. Roberts (1977, p. 86). A:P-9.

Neghereting (= Negheretting); *Assam*, INDIA; 26°44′N, 94°07′E; observed in 1969 and 12–15 Feb. 1974 by G. Pilleri (1975, p. 43; Pilleri & Pilleri, 1982, p. 158). B:I-23.

Neilingding Dao (= Lintin Island), 50–340 m; *Guangdong*, CHINA; ca. 22°25′N, 113°48′E; tentatively reported before 1863 by R. Swinhoe (1863, p. 351). Collected 25 Oct. 1981 by Liu Zhenhe and Xu Longhuei (Liu Zhenhe, SCIEA, pers.comm., 26 Nov. 1895); SCIEA, 1. Observed Dec. 1984 by Liu Zhenhe, SCIEA (pers. comm., 25 Nov. 1985). Observed 1988–1990 by Feng Min, Jiang Haisheng, Wang Jun (1997, p. 27). Reported 25 Aug. 1993 by M. W. Lau (1995, p. 209). C:C-212.

NEPAL. See [Katmandu Valley].

Nepal Tarai. See Terai.

Newakot. See Trisuli Bazar.

New Forest Estate. See Dehra Dun vicinity.

Ngamda (?= Kintachié; ?= Houmda); *Xizang* (= *Tibet*), CHINA; ca. 31°05′N, 96°43′E; captive purchased 7 May 1890 by G. Bonvalot and H. d'Orleans (Bonvalot, 1891, vol. 2, pp. 149, 156; 1892, p. 505; Bonvalot et al., 1891, map); captive living in menagerie of MNHN, 22 Aug. 1892 (Milne-Edwards, 1892, p. 671); skin possibly in MNHN (see below, Tibet). B:C-14.

Nghe An, VIETNAM; 18°35′–20°00′N, 103°50′–105°50′E; collected in 1959 and Nov. 1961 by unknown collectors; ZMVNU, 3 (skulls only). Not mapped (see C:V-24 through C:V-26).

Nghia Dan (= Nghia Hung, Phu Qui), 100 ft (= 30 m); *Nghe An*, VIETNAM; 19°19′N, 105°25′E; collected 28 Feb. 1928 by J. Delacour and W. P. Lowe (Delacour, 1929, p. 198); BM(NH), 1. C:V-24.

Nghia Dung, Tan Ky District, *Nghe An*, VIETNAM; 19°07′N, 105°21′E; collected 4 and 9 Dec. 1964 by Lo Van Hong (Dao, 1985, p. 216; Nisbitt & Ciochon, 1993, p. 772; cf. Dang, 1983, p. 1282); IEBR, 2. C:V-24.

Nghia Hung. See Nghia Dan.

Nghia Lo. See *Yen Bai*.

Nhera/Tara Devi, Simla vicinity; *Himachal Pradesh*, INDIA; ca. 31°05′N, 77°09′E; observed Aug. 1972–Feb. 1973 by K. Wada (1984, p. 474). A:I-18.

Nheri. See Narkanda, ca. 1 km north of.

Nimaijan-Bahdhora; *Assam*, INDIA; ca. 27°00′N, 94°41′E; reported 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 31). B:I-25.

Ningdu; *Jiangxi*, CHINA; 26°22′N, 115°48′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-100.

Ninggang; *Jiangxi*, CHINA; 26°45′N, 113°58′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-103.

Ningming; *Guangxi*, CHINA; 22°12′N, 107°05′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-227.

Nirmal, 16 km east of, Adilabad District, 360 m; *Andhra Pradesh*, INDIA; 19°05′N, 78°30′E; observed 26 Mar. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 466). A:I-114.

Nishangara, Bahraich District; *Uttar Pradesh*, INDIA; 28°15′N, 81°13′E; collected 1956–1957 by Zoological Survey of India (Kurup, 1965, pp. 186, 193); museum unknown (not seen). A:I-56.

Nishangara vicinity; *Uttar Pradesh*, INDIA; ca. 28°15′N, 81°13′E; observed 1955–1957 by G. A. von Maydell (Oboussier & von Maydell, 1960, p. 144). A:I-56.

Noakhali, BANGLADESH; ca. 22°45′N, 91°10′E; reported before 1982 by M. A. R. Khan (1981, p. 13). B:Ba-31.

Nodoa. See Nada.

Nong Khai (= Nong Kay; Nong Kha), Camp No. 28; *Nong Khai*, THAILAND; 17°52′N, 102°44′E; collected 9 Feb. 1920 by J. Bangassar (C. B. Kloss, unpublished itinerary notes, ZRC); ZRC, 2. B:T-11.

Nonglin, Mengla Xian, 670 m; *Yunnan*, CHINA; ca. 21°28′N, 101°35′E; collected 19 Dec. 1959 by Deng Xiangfu; KIZ, 1 (skull only). B:C-86.

Nongpoh, Khasi Hills, 1200 ft (= 370 m); Meghalaya INDIA; 25°54′N, 91°53′E; collected 27 May 1920 by H. W. Wells (Hinton & Lindsay, 1926, p. 385); BM(NH), 1. B:I-17.

Nongxin Water Regulation Forest Reserve; *Guangxi*, CHINA; 22°55′N, 105°53′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 128; letter, Aug. 1996). C:C-165.

Nordchina. See CHINA, northern.

North Cachar Hills; *Assam*, INDIA; ca. 25°10′N, 93°00′E; reported Dec. 1972–Feb. 1973 by R. L. Tilson (1983, p. 399). B:I-36.

North District, eastern; *Tripura*, INDIA; ca. 24°00′N, 92°25′E; observed May–June 1978 by R. P. Mukherjee (1982, p. 71). Observed May–Aug. 1989 by A. K. Gupta (1994, p. 102). B:I-41.

North District, north-central; *Tripura*, INDIA; ca. 24°20′N, 92°00′E; observed May–Aug. 1989 by A. K. Gupta (1994, p. 102). B:I-40.

North District, northeastern; *Tripura*, INDIA; ca. 24°20′N, 92°25′E; reported May–June 1978 by

R. P. Mukherjee (1982, p. 71). Observed May–Aug. 1989 by A. K. Gupta (1994, p. 102). B:I-39.

North District, northwestern; *Tripura*, INDIA; ca. 24°11′N, 91°49′E; observed May–Aug. 1989 by A. K. Gupta (1994, p. 102). B:I-40.

North District, southeastern; *Tripura*, INDIA; ca. 23°47′N, 92°14′E; observed May–Aug. 1989 by A. K. Gupta (1994, p. 102). B:I-42.

North District, southwestern; *Tripura*, INDIA; ca. 23°42′N, 92°01′E; observed May–Aug. 1989 by A. K. Gupta (1994, p. 102). B:I-42.

North District, western; *Tripura*, INDIA; ca. 24°00′N, 91°49′E; observed May–June 1978 by R. P. Mukherjee (1982, p. 71). Observed May–Aug. 1989 by A. K. Gupta (1994, p. 102). B:I-40.

North Kamrup. See Bogra Nadi.

North Lena Island. See Dangan Dao.

North VIETNAM; 17°–23°N, 102°–107°E; tissue samples obtained ca. 1991 by Zhang Yaping and Shi Liming (1993b, p. 589). Not mapped.

Nuguvedu. See Yeppuru.

Nu Jiang (= Salween River), above Changlung; *Yunnan*, CHINA; ca. 24°15′N, 99°05′E; tentatively reported Mar. 1917 by R. C. Andrews (in Andrews & Andrews, 1918, p. 279). B:C-65.

Nurestan (= Nuristan), eastern; *Konarha*, AFGHANISTAN; ca. 35°30′N, 71°30′E; captive obtained in 1906 by H. McMahon (Pocock, 1932, p. 543); died 19 Jan 1910 in Regents Park Zoo; BM(NH), 1 (skin only). A:A-1.

Nurestan (region), densely wooded districts; *Konarha*, *Laghman*, or *Nangarhar*; AFGHANISTAN; 34°–36°N, 70°–72°E; reported before 1860 by H. G. Raverty (1859, p. 332). Not mapped.

Nurestan vicinity; *Laghman*, AFGHANISTAN; 35°00′N, 70°20′E; reported before 1972 by A. Puget (1971, p. 201); A:A-4.

Nur Valley. See Khyber Pass vicinity.

Nyachuka. See Yajiang.

Nyainqentanglha Sheng (region); *Xizang* (= *Tibet*), CHINA; ca. 29°–32°N, 90°–96°E; reported before 1964 by Shen Xiaozhou (1963, p. 140; cf. Fooden, 1982a, pp. 26, 51; 1989, p. 44). Not mapped (see B:C-1, B:C-3, and B:C-6 through B:C-13).

Nychow (?= Yai-cheng) vicinity; Hainan Dao; *Hainan*, CHINA; ca. 18°22′N, 109°08′E; collected Mar. 1868 by R. Swinhoe (1870, p. 226; Napier, 1981, p. 22); BM(NH), 1. C:C-237.

Old Chandpur Bazar. See Chandpur Bazar, old.

Olongche (?= Wolongshi); *Sichuan*, CHINA; ca. 30°03′N, 101°21′E; collected [21 Jun. 1890] by G. Bonvalot and H. d'Orleans (Bonvalot, 1892, p. 506); MNHM, 2 (including 1 skull only). B:C-28.

Omei, Mount. See Emei Shan.

Orcha, ca. 1 km northwest of, Bastar District; *Madhya Pradesh*, INDIA; ca. 19°22′N, 81°12′E; observed Nov. 1958–Nov. 1959 by P. Jay (1963, p. 281; 1965, p. 210; cf. Fooden, 1989, p. 44). B:I-111.

Ou, Nam (= Nam hou); *Louangphrabang*, LAOS; ca. 20°30′N, 102°35′E; collected ca. Apr. 1892 by H. d'Orleans (Gagnepain, 1944, map 1, p. 45); MNHN, 1 (skull only). B:L-2.

Ou, Nam, between Muang Khoua and Muang Ngoy; *Louangphrabang* or *Phongsali*, LAOS; ca. 21°00′N, 102°45′E; collected 20 May 1929 by R. W. Hendee (field catalog, FMNH, p. 49; Bangs & Van Tyne, 1931, p. 37; Osgood, 1932, p. 195) FMNH, 1. B:L-1.

Ououlongtche. See Olongche.

Outapour, south of; *Konarha*, AFGHANISTAN; ca. 34°50′N, 70°50′E; reported before 1972 by A. Puget (1971, p. 201). A:A-7.

Ovra (= Overa) Sanctuary, proposed, 2135 m; *Jammu & Kashmir*, INDIA; ca. 34°00′N, 75°00′E; observed Apr.–May 1981 by P. C. Tak and G. Kumar (1984, p. 203; Roonwal & Tak, 1981, p. 96). A:I-2.

Paach piror mukam; *Assam*, INDIA; ca. 24°16′N, 92°30′E; observed 21–25 Mar. 1986 by A. Choudhury (1983, p. 14; 1989, p. 491; [1991b], p. 124). B:I-39.

Pablakhali; *Chittagong Hill Tracts*, BANGLADESH; 23°17′N, 92°07′E; observed Feb. 1990–June 1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, p. 76). B:Ba-34.

Paddavaram, Guntur District; *Andhra Pradesh*, INDIA; 16°01′N, 79°38′E; population reportedly introduced in 1977, observed 5 May 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 471). Not mapped.

Padua; *Chittagong*, BANGLADESH; 22°03′N, 92°07′E; observed Feb. 1990–June 1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, p. 76). B:Ba-38.

Pahalgam vicinity. See Ovra (= Overa) Sanctuary.

Paia, ca. 6 mi (= 10 km) east of Shogran, Hazara Division, 8700 ft (= 2650 m); *North-West Frontier*, PAKISTAN; 34°37′N, 73°33′E; collected 5 Aug. 1964 by M. Iqbal (Roberts, 1977, p. 343); USNM, 1. A:P-10.

Pajja Hill, north of Mardan; *North-West Frontier*,

PAKISTAN; ca. 34°12′N, 72°02′E; observed 1899–1901 by unidentified British officers (McMahon, 1901b, p. 9). A:P-7.

Pakhal Lake, west side, Warangal District, 340 m; *Andhra Pradesh*, INDIA; 17°56′N, 79°58′E; observed 19 and 20 Apr. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 467). A:I-133.

Pakhal Wild Life Sanctuary; *Andhra Pradesh*, INDIA; 17°50′–18°05′N, 79°55′–80°10′E; reported Nov. 1966 by J. J. Spillett (1968, p. 8). Not mapped (see A:I-133).

PAKISTAN; 33°–36°N, 71°–74°E; obtained in Karachi (extralimital) before 1949 by R. Henry; IRSN, 3. Not mapped.

Paksane. See Muang Pakxan.

Palamau; *Bihar*, INDIA; ca. 23°50′N, 84°10′E; observed 22 Feb. 1970 by M. Krishnan (1972, p. 540). A:I-92.

Palampeta, Mulug Taluk, Warangal District; *Andhra Pradesh*, INDIA; 18°16′N, 79°56′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18). A:I-120.

Pallepadu (= Pallipad), Khammam Taluk, Khammam District, *Andhra Pradesh*, INDIA; 17°12′N, 80°20′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 19). A:I-132.

Pamulaparthi (= Pamulparthi), Gajwel Taluk, Medak District; *Andhra Pradesh*, INDIA; 17°46′N, 78°42′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18). A:I-123.

Pang Nam Un; *Nan*, THAILAND; 18°30′N, 100°33′E; collected 25 Jan. 1953 by R. E. Elbel and Prasit Seecharong (Moore & Tate, 1965, p. 329). USNM, 1. B:T-3.

Panighatta; *West Bengal*, INDIA; 26°48′N, 88°15′E; observed in 1962 by C. H. Southwick, A. Ghosh, and C. D. Louch (1964, p. 446). B:I-6.

Panipat-Rhotak, highway between; *Haryana*, INDIA; ca. 29°05′N, 76°40′E; observed 1964–1965 by R. P. Mukherjee and G. D. Mukherjee (1972, p. 67). A:I-37.

Pankhabari. See Simulbari-Pankhaburi.

Paras vicinity, lower Kaghan Valley; *North-West Frontier*, PAKISTAN; ca. 34°39′N, 73°31′E; reported before 1978 by T. J. Roberts (1977, p. 86). A:P-10.

Pashok; *Sikkim*, INDIA; 27°03′N, 88°25′E; improbable report (Wroughton, 1916d, p. 776; cf. Fooden, 1982a, p. 51). Not mapped.

Pashupati, 4400 ft (= 1300 m); *Katmandu Valley*, NEPAL; ca. 27°38′N, 85°21′E; observed 1974–1975 by H. Taylor, J. Teas, T. Richie, C. Southwick, and R. Shrestha (1978, p. 344). Observed 1975–1978 by J. Teas (1983, p. 224). Reported before 1982 by T. K. Shrestha (1981, p. 269). Reported 13 Aug. 1996 by N. Shrestha (1997, p. 31). Observed 1995–1998 by M.K. Chalise and M. Ghimire (1998, p. 11). A:N-12.

Patang. See Batang vicinity.

Patharia (= Pathalia); *Moulvi Bazar*, BANGLADESH; ca. 24°45′N, 92°15′E; reported early in 1980 by S.P. Gittins and A. W. Akonda (1982, p. 278). Observed Feb. 1990–June 1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, pp. 76, 79). B:Ba-11.

Patiala District; *Punjab*, INDIA; ca. 30°19′N, 76°24′E; observed 1981–1983 by P.K. Seth, S. Seth, G. L. Reddy, and P. K. Chopra (1992, p. 62). A:I-21.

Patriata, Murree region, 7150 ft (= 2180 m); *Punjab*, PAKISTAN; 33°51′N, 73°29′E; collected 14–15 June 1923 by H. W. Wells (in Lindsay, 1926, p. 608); BM(NH), 1; BNHS, 1. A:P-12.

Peak. See [Victoria] Peak.

Pekin. See Beijing.

Phala/Kutbor Game Reserve; *Azad Kashmir*, PAKISTAN; ca. 34°00′N, 73°35′E; reported before 1984 by M. Nawaz (1983, p. 6). A:P-12.

Phatuntula; *Sylhet*, BANGLADESH; not precisely located, 24°08′–24°50′N, 91°37–92°17′E; observed Feb. 1990–June 1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, p. 76). Not mapped.

Phawngpui Wildlife Sanctuary; *Mizoram*, INDIA; ca. 22°40′N, 93°03′E; observed 13–18 Jan. 1994 by T. R. S. Raman, C. Mishra, and A. J. T. Johnsingh (1996, p. 59). B:I-43.

Phu Qui. See Nghia Dan.

Phu Vach, Tan Lac District; *Hoa Binh*, VIETNAM; ca. 20°35′N, 105°18′E; collected 21 Jan. 1973 by Pham Trong Anh; IEBR, 1 (skin only). C:V-21.

Piangzu, 3.5 km northeast of Banli, Luoshan Subcounty, Jinxiu Xian; *Guangxi*, CHINA; ca. 24°02′N, 110°15′E; captive purchased ca. 1987 by Zhong Changwan (pers. comm., 21 Nov. 1992); died in 1991; skeleton examined 21 Nov. 1992 at Banli. C:C-195.

Pidaung Reserve. See Karen Chaung.

Pilibhit-Tanakpur, highway between; *Uttar Pradesh*, INDIA; ca. 28°45′N, 79°50′E; observed Sept. 1959–June 1960 by C. H. Southwick, M. A. Beg, and M. R. Siddiqi (1961b, p. 702). A:I-51.

Pina, forests above, Rara Daha (= Lake) vicinity;

Jumla, NEPAL; ca. 29°33′N, 82°05′E; observed Nov. 1979 by P. Byrne (1982, p. 115). A:N-6.

Pingbian; *Yunnan*, CHINA; 22°54′N, 103°40′E; reported before 1992 by Jiang Xuelong, Wang Yingxiang, and Ma Shilai (1991, p. 242). C:C-151.

Pinglang. See Batu.

Pingnan Xian; *Fujian*, CHINA; ca. 26°56′N, 119°03′E; reported Sept. 1980 by Zheng Xueqing (1984, p. 146). C:C-70.

Pingwu; *Sichuan*, CHINA; 32°25′N, 104°36′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-24.

Pinxiang vicinity; *Jiangxi*, CHINA; ca. 27°37′N, 113°51′E; captured in 1983 for Pingxiang Zoo; observed at zoo in summer 1984 by Sheng Helin, ECNU (pers. comm., 19 Oct. 1985). C:C-106.

Pisui, Loi-Gebiet, Hainan Dao; *Hainan*, CHINA; ca. 19°02′N, 109°43′E; collected 19 Mar. 1909 by H. Schoede; ZMB, 1. C:C-232.

Plateau des Bolovens. See Muang Thateng.

Pochuan, 6–7 km west of, Xianan Subcounty, Huanjiang Xian, 460 m; *Guangxi*, CHINA; ca. 25°00′N, 107°52′E; collected 25 Oct. 1992 by Tan Nenrui (pers. comm., 5 Nov. 1992); IZCAS, 1. C:C-177.

Podumoni. See Tinsukia.

Pokhara; *West No. 4*, NEPAL; 28°12′N, 83°56′E; observed Mar. 1996 by M. K. Chalise and M. Ghimire (1998, p. 12; e-mail, 20 Nov. 1998). Reported at Annapurna Conservation Area before 1997 by K. K. Gurung and R. Singh (1996, p. 78). A:N-supplementary.

Po Lu, Ba Be vicinity; *Cao Bang*, VIETNAM; ca. 22°24′N, 105°38′E; collected 6 Aug. 1967 by Vo Quy; ZMVNU, 1 (skull only). C:V-8.

Popa Hill; *Mandalay*, MYANMAR (= BURMA); ca. 20°55′N, 95°15′E; observed Feb. 1984 by C. H. Southwick and K. L. Southwick (1985, p. 35). B:M-27.

Popa Hill, 1000 m; *Mandalay*, MYANMAR (= BURMA); 20°55′N, 95°15′E; collected 21 Oct.–5 Nov. 1937 by G. Heinrich; AMNH, 6. B:M-27.

Popa Hill, 4961 ft (= 1512 m); *Mandalay*, MYANMAR (= BURMA); 20°55′N, 95°15′E; collected July–Oct. 1913 by G. C. Shortridge (in Wroughton, 1915a, p. 461); BM(NH), 1; BNHS, 5 (including 1 skull only). B:M-27.

Prag Oil Mill. See Aligarh.

Prome. See Pye.

Pu'er Xian; *Yunnan*, CHINA; ca. 23°05′N, 101°03′E; immunological survey conducted before 1996 by Duan Xingsheng, Liu Yuanwei, Wu Jing, Dao Weiying, and Liu Jianghai (1995, p. 411). B:C-77.

Pucheng Xian; *Fujian*, CHINA; ca. 27°55′N, 118°30′E; collected 15 Aug. 1960 by unknown collector; SCIEA, 1 (skin only). Reported Aug. 1980 by Zheng Xueqing (1984, p. 145). C:C-75.

Pulareddi. See Siddeldar Hill.

Pulga; *Himachal Pradesh*, INDIA; ca. 32°00′N, 77°30′E; reported 1978–1980 by A. J. Gaston, P. J. Garson, and M. L. Hunter, Jr. (1983, p. 300). A:I-15.

Punch Bol, Amravati District, 825 m; *Maharashtra*, INDIA; 21°26′N, 77°17′E; observed 31 Jan. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 466). A:I-101.

Puquan Road Maintenance Station, Zhongliang Subcounty, Jinxiu Xian, 850 m; *Guangxi*, CHINA; 24°11′N, 110°19′E; observed in 1991 by Mo Cailian and Mo Xiuzhen, road maintenance workers (pers. comm., 14 Nov. 1992). C:C-195.

Puran Bazar, Chandpur Division; *Chandpur*; BANGLADESH; 23°20′N, 90°47′E; reported before 1986 by M. A. R. Khan (1981, p. 13; 1985, p. 31). B:Ba-28.

Puri, 25 m; *Orissa*, INDIA; 19°48′N, 85°50′E; observed 16 Feb. 1980 by R. P. Mukherjee (1984, p. 261). Observed 21 May 1980 by J. Fooden. A:I-106.

Pyaunggaung, 2794 ft (= 852 m); *Shan*, MYANMAR (= BURMA); 22°35′N, 97°05′E; collected 8 and 14 May 1913 by G. C. Shortridge (in Ryley, 1914, p. 713; Moore & Tate, 1965, p. 330); BM(NH), 2 (including 1 in alcohol); BNHS, 2 (including 1 skull only). B:M-20.

Pye (= Prome), 30 mi (= 50 km) southeast of, 200 ft (= 60 m); *Irrawaddy*, MYANMAR (= BURMA); ca. 18°30′N, 95°30′E; collected 2 Feb. 1917 by J. M. D. Mackenzie (Wroughton, 1921, p. 553); BNHS, 1. B:M-34.

Pye (= Prome), 35 mi (= 55 km) southeast of, 800 ft (= 240 m); Pegu, MYANMAR (= BURMA); ca. 18°30′N, 95°35′E; collected 25 Oct. 1916 by J. M. D. Mackenzie (Wroughton, 1921, p. 553); BM(NH), 1. B:M-34.

Qamdo; *Xizang* (= *Tibet*), CHINA; 31°10′N, 97°14′E; reported before 1992 by Jiang Xuelong, Wang Yingxiang, and Ma Shilai (1991, p. 245). B:C-21.

Qasimpur Canal; *Uttar Pradesh*, INDIA; 27°59′N, 78°09′E; observed 1959–1975 by C. H. Southwick and M. F. Siddiqi (1977, p. 342). A:I-69.

Qianjiandong Water Regulation Forest Reserve; *Guangxi*, CHINA; ca. 25°26′N, 111°16′E; ob-

served 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 128; letter, Aug. 1996). C:C-191.

Qianxian. See Yixian.

Qiasui, Huaiji Xian; *Guangdong*, CHINA; ca. 24°06′N, 112°20′E; reported Apr. 1982 by local residents (Liu Zhenhe, SCIEA, pers. comm., 26 Nov. 1985). C:C-107.

Qigong, Yangshan Xian; *Guangdong*, CHINA; 24°18′N, 112°34′E; reported July 1982 by local residents (Liu Zhenhe, SCIEA, pers. comm., 25 Nov. 1985). C:C-206.

Qihong, Qimen Xian, 200–600 m; *Anhui*, CHINA; ca. 29°35′N, 117°40′E; observed 1973–1986 by Xiong Chenpei (Wada et al., 1986, p. 83). C:C-63.

Qingchuan; *Sichuan*, CHINA; 32°36′N, 105°09′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-23.

Qingliangfeng, Jixi Xian, 800 m; *Anhui*, CHINA; ca. 30°10′N, 118°50′E; observed 1973–1986 by Xiong Chenpei (Wada et al., 1986, p. 83). C:C-55.

Qinglong Shan Water Regulation Forest Reserve; *Guangxi*, CHINA; ca. 22°33′N, 106°42′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 129; letter, Aug. 1996). C:C-224.

Qingshi Tan Water Regulation Forest Reserve; *Guangxi*, CHINA; ca. 25°36′N, 110°11′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 127; letter, Aug. 1996). C:C-193.

Qingzhen; *Guizhou*, CHINA; 26°33′N, 106°28′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-145.

Qinyang; *Henan*, CHINA; 35°06′N, 112°57′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-11.

Qionglai; *Sichuan*, CHINA; 30°25′N, 103°29′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-29.

Quan Lan, Dao; *Quang Ninh*, VIETNAM; ca. 20°52′N, 107°30′E; collected 3 June 1969 by unknown collector; IEBR, 1 (skull only). C:V-13.

Quang Ninh. See Xuan Ninh.

Quanzhou; *Guangxi*, CHINA; 25°57′N, 111°04′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-188.

Qusum Xian; *Xizang* (= *Tibet*), CHINA; ca. 29°05′N, 92°10′E; observed 1979–1982 by Zhang Cizu, Director, Shanghai Zoo (pers. comm., 18 Oct. 1985). B:C-3.

Quxian; *Zhejiang*, CHINA; 28°58′N, 118°52′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-64.

Raghunandan; *Habiganj*, BANGLADESH; ca. 24°10′N, 91°20′E; observed early in 1980 by S. P. Gittins and A. W. Akonda (1982, p. 278). B:Ba-14.

Raghunathapalle, Jangaon Taluk, Warangal District; *Andhra Pradesh*, INDIA; 17°45′N, 79°15′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18). A:I-122.

Raigir, Hyderabad District; *Andhra Pradesh*, INDIA; 17°32′N, 78°57′E; observed 1972–1973 by N. Koyama and P. B. Shekar (1981, p. 248). A:I-125.

Railway Station. See Aligarh.

Raimona vicinity, Goalpara district, <270 m; *Assam*, INDIA; 26°39′N, 89°58′E; collected 1956–1957 by Zoological Survey of India (Kurup, 1965, pp. 188, 193); museum unknown (not seen). Reported before 1963 by H. Khajuria (1962b, p. 128). Observed May–June 1973 by R. P. Mukherjee and S. S. Saha (1974, p. 337; Mukherjee, 1978b, p. 742). B:I-10.

Raj Bhavan compound. See Mumbai.

Rajahmundry, 3 km northeast of, East Godavari District, 50 m; *Andhra Pradesh*, INDIA; 17°02′N, 81°49′E; observed 18 May 1980 by J.Fooden, A. Mahabal, and S. S. Saha (1981, p. 467). A:I-138.

Rajahmundry, 13 km northeast of, East Godavari District, 75 m; *Andhra Pradesh*, INDIA; 17°03′N, 81°52′E; observed 18 May 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 467). A:I-138.

Rajaji and Corbett National Parks; *Uttar Pradesh*, INDIA; 29°25′–30°13′N, 77°54′–79°05′E; reported before 1995 by A. J. T. Johnsingh and J. Joshua (1994, p. 137). Not mapped (see A:I-27 and A:I-33).

Rajaji Wildlife Sanctuary, 365–610 m; *Uttar Pradesh*, INDIA; ca. 30°10′N, 78°00′E; observed Mar.–Dec. 1978 by J. W. Laws and J. V. H. Laws (1984, p. 35). A:I-27.

Rajapara, South Kamrup, 600 ft (= 180 m); *Assam*, INDIA; ca. 25°55′N, 91°15′E; collected 21 and 25 Nov. 1920 by H. W. Wells (Hinton & Lindsay, 1926, p. 385); BM(NH), 2 (including 1 skin only). B:I-15.

Rajendrapur forest. See Ghazipur.

Rajkandi; *Moulvi Bazar*, BANGLADESH; ca. 24°15′N, 91°55′E; reported early in 1980 by S.P. Gittins and A. W. Akonda (1982, p. 278). Reported Oct. 1986, Apr. 1988, and Nov. 1988 by C. B. Stanford (1992, p. 190). Observed

Feb. 1990–June 1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, p. 76). B:Ba-13.

Rajmai tea garden, east of National Highway No. 37; *Assam*, INDIA; ca; 27°07′N, 94°44′E; observed 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 32). B:I-25.

Rajmai tea garden, west of National Highway No. 37; *Assam*, INDIA; ca. 27°07′N, 94°43′E; observed 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 32). B:I-25.

Rama Pass. See Xi Golog.

Ramban Township vicinity; *Jammu & Kashmir*, INDIA; ca. 33°15′N, 75°15′E; parasitological survey conducted ca. Nov. 1973 by D. Weinman (1974, p. 345). A:I-4.

Ramganga River, Corbett National Park; *Uttar Pradesh*, INDIA; ca. 29°35′N, 79°05′E; observed Sept. 1959–June 1960 and 1964–1965 by C. H. Southwick, M. A. Beg, and M. R. Siddiqi (1961b, p. 703; Southwick & M. R. Siddiqi, 1966, p. 312). A:I-33.

Ramganga South Station, near Bareilly; *Uttar Pradesh*, INDIA; ca. 28°21′N, 79°25′E; observed 1990–1991 by C. H. Southwick and M. F. Siddiqi (1994a, p. 227). A:I-52.

Ramnagar; *Chitawan*, NEPAL; 27°44′N, 84°27′E; observed 1992–1994 by M. K. Chalise and M. Ghimire (1998, p. 11). A:N-supplementary.

Ramnagar; *Jammu & Kashmir* INDIA; 32°49′N, 75°19′E; observed before 1983 by Y. R. Malhotra and D. N. Sahi (1982, p. 27). A:I-9.

Ramnagar, Kumaun region, 1100 ft (= 340 m); *Uttar Pradesh*, INDIA; ca. 29°24′N, 79°07′E; collected Aug. 1913–Mar. 1914 by C. A. Crump (in Wroughton, 1914, p. 284; Napier, 1981, p. 24); BM(NH), 3 (1 skin only, 2 skulls only); BNHS, 1. A:I-33.

Rampur, northwest of; *Himachal Pradesh*, INDIA; ca. 31°27′N, 77°38′E reported Aug. 1972–Feb. 1973 by K. Wada (1984, p. 476). A:I-17.

Rampur-Ghaziabad; *Uttar Pradesh*, INDIA; ca. 28°50′N, 78°10′E; observed 29 Oct. 1964–9 May 1965 by C. H. Southwick, D. Lindburg, P. Jay, M. Khati, and B. Singh (Southwick and M. R. Siddiqi, 1966, p. 306). A:I-47.

Rangoli Reserve Forest. See Diroi (Rangoli) Reserve Forest.

Rangpur, BANGLADESH; ca. 25°40′N, 89°20′E; reported before 1982 by M. A. R. Khan (1981, p. 13; 1985, p. 31). B:Ba-2.

Rara Daha (= Lake). See Hutu Forest; Pina.

Rasulpur vicinity, Madhupur Forest; *Tangail*, BANGLADESH; ca. 24°42′N, 90°09′E; observed May 1977 by J. R. Oppenheimer, A. W. Akonda, and K. Z. Husain (1983, p. 194). B:Ba-7.

Ratighat, Naini Tal vicinity, Kumaun region, 3700 ft and 3800 ft (1130 m and 1160 m) *Uttar Pradesh*, INDIA; 29°27′N, 79°29′E; collected 1–8 Nov. 1913 by C.A. Crump (in Wroughton, 1914, p. 283); BM(NH), 2; BNHS, 1. A:I-32.

Rehnathapalli. See Raghunathapalle.

Rema-Kalenga, *Moulvi Bazar*; BANGLADESH; ca. 24°06′N, 91°36′E; observed Feb. 1990–June 1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, pp. 76, 79). B:Ba-13.

Rest House. See Dehra Dun vicinity.

Rewari-Patudi-Gurgaon, highway between *Haryana*, INDIA; ca. 28°20′N, 76°50′E; observed 1964–1965 by R. P. Mukherjee and G. D. Mukherjee (1972, p. 67). A:I-42.

Ridge. See Simla vicinity.

Ripon Hospital. See Simla vicinty.

Rohtak District; *Haryana*, INDIA; ca. 28°53′N, 76°44′E; observed 1981–1983 by P. K. Seth, S. Seth, G. L. Reddy, and P. K. Chopra (1992, p. 62). A:I-37.

Rongrenggiri vicinity, Garo hills; *Assam*, INDIA; ca. 25°33′N, 90°34′E; observed Jan.–Feb. 1957 by H. Khajuria (1962a, p. 122). B:I-13.

Rongtong. See Sukna-Kurseong.

Rouétoundo (= Routéoundo); *Xizang* (= *Tibet*), CHINA; ca. 31°35′N, 97°25′E; infant captured and two specimens collected 17 May 1890 by G. Bonvalot and H. d'Orleans (Bonvalot, 1891, vol. 2, p. 156; 1892, p. 505; Bonvalot et al., 1891, map); skins possibly in MNHN (see below, Tibet). B:C-20.

Royal Manas National Park; *Galygpug*, BHUTAN; ca. 26°47′N, 90°50′E; reported before 1990 by P. B. Subba and C. Santiapillai (1991–92, p. 32). Reported before 1997 by K. K. Gurung and R. Singh (1996, p. 104). B:Bh-1.

Rucun, Xiuning Xian, 500–800 m; *Anhui*, CHINA; ca. 29°55′N, 118°07′E; observed 1973–1986 by Xiong Chenpei, K. Wada, and Wang Qishan (Wada et al., 1986, pp. 83, 88). C:C-62.

Rudrur Agricultural Station, Nizamabad District, 440 m; *Andhra Pradesh*, INDIA; 18°35′N, 77°53′E; observed 16 Apr. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 467). A:I-116.

Ruicheng; *Shanxi*, CHINA; 34°42′N, 110°42′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-15.

Russian Camp, Birganj Forest District; *Bara*, NEPAL; 27°12′N, 85°04′E; observed June 1964–

Dec. 1965 by D. L. Chesemore (1970, p. 164). A:N-13.

S. A. Factory. See Dhaka.

Sabaya Khola; *Dhankuta*, NEPAL; ca. 27°20′N, 87°15′E; observed ca. 1973 by J. A. McNeeley (letter, 4 Feb. 1973). B:N-2.

Sadard Devi, 1 km west of, Valsad District, 75 m; *Gujarat*, INDIA; 20°48′N, 73°29′E; observed 9 Jan. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 466). A:I-99.

Sagarmatha (= Mount Everest) National Park; *East No. 3*, NEPAL; ca. 27°55′N, 86°50′E′; reported before 1997 by K. K. Gurung and R. Singh (1996, p. 114). B:N-supplementary.

Saharanpur District; *Uttar Pradesh*, INDIA; 29°30′–30°20′N, 77°00′–78°10′E; observed 1981–1983 by P. K. Seth, S. Seth, G. L. Reddy, and P. K. Chopra (1992, p. 62). Not mapped (see A:I-25).

Saharanpur vicinity; *Uttar Pradesh*, INDIA; ca. 29°58′N, 77°33′E; autopsied ca. 1966 by K. K. Chawla, C. D. S. Murthy, R. N. Chakravarti, and P. N. Chhutani (1967, p. 85). A:I-25.

Sahebgunj, Gaya; *Bihar*, INDIA; ca. 24°50′N, 85°00′E; reported 1811–1812 by F. Buchanan ([1936], p. 403, posthumous publication). A:I-91.

Sainj; *Himachal Pradesh*, INDIA; ca. 31°45′N, 77°25′E; reported 1978–1980 by A. J. Gaston, P. J. Garson, and M. L. Hunter, Jr. (1983, p. 300). A:I-16.

Saktesgarh; *Uttar Pradesh*, INDIA; 24°59′N, 82°49′E; collected before 1849 by unknown collector (Napier, 1981, p. 25); BM(NH), 1 (skull only). A:I-86.

Sala Reserve Forest; *Assam*, INDIA; ca. 27°00′N, 94°54′E; observed 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 32). B:I-25.

Salween River. See Nu Jiang.

Samaguting; *Nagaland*, INDIA; 25°47′N, 93°47′E; collected before 1873 by J. Butler (Anderson, 1881, p. 69); ZSI, 1 (skin only). B: I-34.

Samayala (= Samyala), Kangra Valley, 5000 ft (= 1500 m); *Himachal Pradesh*, INDIA; ca. 32°10′N, 76°25′E; collected 9 May 1922 by H. W. Wells (Lindsay, 1926, p. 599); BM(NH), 2. A: I-12.

Sambalpur. See Deogarh.

Sam Shui Wan Valley; *Xianggang* (= *Hong Kong*), CHINA; ca. 22°14′N, 114°10′E; reported before 1952 by G. A. C. Herklots (1951, p. 83). C:C-210.

Sandu; *Guizhou*, CHINA; 25°59′N, 107°52′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-122.

Sangu/ Matamuhari; *Bandarban*, BANGLADESH; ca. 21°30′N, 92°30′E; reported early in 1980 by S. P. Gittins and A. W. Akonda (1982, p. 278). B:Ba-37.

Sangzhi; *Hunan*, CHINA; 29°24′N, 110°09′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-111.

Sankat Mochan Temple. See Varanasi.

Sankhu-Bajrajogini; *Katmandu Valley*, NEPAL; ca. 27°43′N, 85°27′E; observed June 1996 by M. K. Chalise and M. Ghimire (1998, pp. 12, 15). A:N-supplementary.

Sankhuwa Khola, both banks, Makalu-Barun Conservation Area; *Dhankuta*, NEPAL; ca. 27°30′N, 87°05′E; observed ca. 1997, by M. K. Chalise (1997, p. 31; e-mail, 9 Nov. 1998). B: N-1.

Sanming Xian; *Fujian*, CHINA; ca. 26°14′N, 117°35′E; reported Apr. 1981 by Zheng Xueqing (1984, p. 145). C:C-88.

Sanpihu Water Regulation Forest Reserve; *Guangxi*, CHINA; ca. 25°06′N, 107°13′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 128; letter, Aug. 1996). C:C-173.

Santaishan, Luxi Xian; 1250 m; *Yunnan*, CHINA; ca. 24°15′N, 98°25′E; collected 11 Apr. 1962 by unknown collector (Wang Yingxiang, KIZ, pers. comm., 1 Sept. 1983); KIZ 1. B:C-62.

Sanya, Hainan Dao; *Hainan*, CHINA; 18°14′N, 109°29′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-238.

Sapekhati Reserve Forest; *Assam*, INDIA; ca. 27°08′N, 95°11′E; reported 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 31). B:I-30.

Saraguri; *Assam*, INDIA; ca. 27°00′N, 94°29′E; reported 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 31). B:I-25.

Sarahan; *Himachal Pradesh*, INDIA; ca. 31°35′N, 77°30′E; reported 1978–1980 by A. J. Gaston, P. J. Garson, and M. L. Hunter, Jr. (1983, p. 300). A:I-16.

Saraswati Forests, Kurukshetra District; *Haryana*, INDIA; 29°58′N, 76°32′E; observed Oct. 1989–Sept. 1990 by R. C. Gupta and S. Kumar (1992, p. 226). A:I-22.

Sariska Tiger Reserve; *Rajasthan*, INDIA; ca. 27°20′N, 76°25′E; reported May–Oct. 1990 by C. Ross and A. Srivastava (1994, p. 362). Reported before 1997 by K. K. Gurung and R. Singh (1996, p. 116). A:I-74.

Sarupduli. See Ramganga River.

Sasni; *Uttar Pradesh*, INDIA; 27°43′N, 78°05′E; observed Jan. 1990–Mar. 1991 by E. Imam and H. S. A. Yahya (1995, p. 2). A:I-69.

Satghar; *Chittagong*, BANGLADESH; ca. 22°20′N, 92°00′E; observed Feb. 1990–June 1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, p. 76). B:Ba-35.

Satha, mango grove; *Uttar Pradesh*, INDIA; 27°58′N, 78°08′E; observed 1959–1975 by C. H. Southwick and M. F. Siddiqi (1977, p. 342). A:I-69.

Satkhira; *Satkhira*, BANGLADESH; 22°43′N, 89°06′E; reported before 1982 by M. A. R. Khan (1981, p. 13). B:Ba-20.

Satkhira, southern; BANGLADESH; ca. 22°00′N, 89°10′E; observed 1951–1961 by A. K. Mandal (1964, p. 164). B:Ba-22.

Sattenapalle, Guntur District, 75 m; *Andhra Pradesh*, INDIA; 16°23′N, 80°09′E; observed 9 May 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 468). A:I-145.

Sawai Madhopur; *Rajasthan*, INDIA; 25°59′N, 76°22′E; reported before 1965 by I. Prakash (letter, 25 Aug. 1964). A:I-82.

Sayabouri. See *Xaignabouri*.

School Yard. See Chhatari-do-Raha.

Se-eng, Hsipaw District, 1411 ft (= 430 m); *Shan*, MYANMAR (= BURMA); 22°43′N, 97°31′E; collected 25 May 1913 by G. C. Shortridge (in Ryley, 1914, p. 713); BM(NH), 1. B:M-19.

Seoni. See Malua.

Seri. See Sungri, ca. 2 km south of.

Setschuen. See *Sichuan*.

Sevoke. See Sivok.

Shahabad District; *Bihar*, INDIA; ca. 25°30′N, 84°15′E; reported 1809–1810 by F. Buchanan (1934, p. 227), posthumous publication). A:I-90.

Shahjahanpur-Bareilly, highway between; *Uttar Pradesh*, INDIA; ca. 28°00′N, 79°40′E; observed 1964–1965 by R. P. Mukherjee and G. D. Mukherjee (1972, p. 67). A:I-53.

Shahjahanpur-Lucknow, highway between, *Uttar Pradesh*, INDIA; ca. 27°30′N, 80°30′E; observed Sept. 1959–June 1960 by C. H. Southwick, M. A. Beg, and M. R. Siddiqi (1961b, p. 702). A:I-57.

Shakari Bazar. See Dhaka.

Shangang Nature Reserve, Chong'an Xian; *Fujian*, CHINA; 27°45′N, 117°40′E; calls heard in 1982 by Tang Ziying, FUBD (pers. comm., 19 Oct. 1985). C:C-76.

Shangchuan Dao. See Miwan.

Shanghai. See Sichuan.

Shanghang Xian; *Fujian*, CHINA; ca. 25°05′N, 116°30′E; reported Sept. 1982 by Zheng Xueqing (1984, p. 146). C:C-94.

Shangsi; *Guangxi*, CHINA; 22°10′N, 108°00′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-218.

Shangzhou Is. See Miwan.

Shanman, Menghai Xian; *Yunnan*, CHINA; ca. 21°55′N, 100°25′E; collected Nov. 1957 by unknown collector (Wang Yingxiang, KIZ, pers. comm., 1 Sept. 1983); KIZ 1 (skin only). B:C-81.

Shanmoji, Dabu District, Ruyuan Yaozu Zizhixian, >1000 m; *Guangdong*, CHINA; 24°33′N, 113°12′E; captive purchased in 1979 by district purchasing agent (Ling Wenfeng, county forest officer, photos and pers. comm., 10 Nov. 1985). C:C-203.

Shanxi (= Shansi), southeastern, CHINA; ca. 35°20′N, 112°50′E; reported before 1942 by A. de C. Sowerby (1941, p. 261). Reported before 1922 by Jiang Xuelong, Wang Yingxiang, and Ma Shilai (1991, pp. 242, 244). C:C-6.

Shaowu Xian: *Fujian*, CHINA; ca. 27°18′N, 117°30′E; reported June 1983 by Zheng Xueqing (1984, p. 145). C:C-80.

Sha Xian; *Fujian*, CHINA; ca. 26°25′N, 117°45′E; collected 22 Sept. 1960 by unknown collector; SCIEA, 1 (skin only). Reported Apr. 1981 by Zheng Xueqing (1984, p. 145). C:C-82.

Shennongjia Forestry Region; *Hubei*, CHINA; ca. 31°44′N, 110°44′E; reported before 1980 by Xiao Zhi (1979, p. 31). C:C-43.

Shenzhen Shi. See Neilingding Dao.

Sheo, Barmer District; *Rajasthan*, INDIA; 26°11′N, 71°15′E; solitary individual reported ca. 1980 by T. R. Parmar (Bhargava, 1984, p. 43). A:I-79.

Shexian; *Anhui*, CHINA; 29°52′N, 118°26′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-61.

Shihshahshu Temple; *Sichuan*, CHINA; ca. 29°32′N, 103°21′E; reported 4–8 Oct. 1929 by local residents (Stevens, 1934, p. 222; possibly misidentified *M. thibetana*). C:C-139.

Shimen, Qimen Xian, 300–500 m; *Anhui*, CHINA; ca. 29°55′N, 117°45′E; observed 1973–1986 by Xiong Chenpei (Wada et al., 1986, p. 83). C:C-62.

Shimla. See Simla.

Shingaw. See Tanga-Shingaw.

Shing Mun Country Park; *Xianggang* (= *Hong*

Kong), CHINA; ca. 22°23′N, 114°08′E; reported before 1992 by J. R. Fellowes (1992, p. 131). C:C-210.

Shiqian; *Guizhou*, CHINA; 27°30′N, 108°14′E; reported before 1998 (Zhang et al., 1997 p. 58). C:C-119.

Shishi Koh vicinity, Chitral District; *North-West Frontier*, PAKISTAN; ca. 35°35′N, 71°48′E; reported before 1978 by T. J. Roberts (1977, p. 86). A:P-1.

Shiva. See Siva.

Shiwan Dashan Water Regulation Forest Reserve; *Guangxi*, CHINA; ca. 21°49′N, 108°00′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 128; letter, Aug. 1996). C:C-217.

Shocheng. See Shoucheng.

Shogran vicinity, lower Kaghan Valley; *North-West Frontier*, PAKISTAN; ca. 34°37′N, 73°28′E; reported before 1978 by T. J. Roberts (1977, p. 86). A:P-10.

Shoucheng (= Shocheng) Water Regulation Forest Reserve; *Guangxi*, CHINA; ca. 25°16′N, 109°47′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 127; letter, Aug. 1996). C:C-183.

Shuangbai; *Yunnan*, CHINA; 24°40′N, 101°38′E; reported before 1998 (Zhang et al., 1997, p. 58). B:C-51.

Shuanyuan, Anyuan Xian; *Jiangxi*, CHINA; ca. 25°30′N, 115°15′E; reported Oct. 1979 by local residents (Liu Zhenhe, SCIEA, pers. comm., 25 Nov. 1985). C:C-99.

Shuicheng Xian vicinity; *Guizhou*, CHINA; ca. 26°50′N, 105°00′E; reported before 1989 by Tan Bangjie and F. E. Poirier ([1991], p. 131). C:C-144.

Sibsagar. See Golaghat.

Sichuan, CHINA; 26°–34°N, 98°–110°E; reported origin of captive shipped from Shanghai ca. Jan. 1868 (Gray, 1868, p. 61); BM(NH), 1 (holotype of *Macacus lasiotus*). Reported origin of specimen obtained before 2 Oct. 1917 via Qingdao (= Tsingtau) by Assesor Cramer; ZMB, 1. Immunological survey conducted before 1996 by Duan Xingsheng, Liu Yuanwei, Wu Jing, Dao Weiying, and Liu Jianghai (1995, p. 411). Not mapped.

Sichuan, eastern, CHINA; 28°–33°N, 106°–110°E; tissue samples obtained ca. 1991 by Zhang Yaping and Shi Liming (1993b, p. 589). Not mapped.

Sichuan, northwestern, CHINA; 26°–34°N, 98°–103°E; tissue samples obtained ca. 1991 by Zhang Yaping and Shi Liming (1993, p. 589). Not mapped.

Sichuan, west-central, CHINA; 28°–32°N, 99°–102°E; tissue sample obtained ca. 1991 by Zhang Yaping and Shi Liming (1993b, p. 589). Not mapped.

Siddeldar Hill, Nagarjunakonda Valley, 2 mi (= 3 km) northeast of Pullareddigudem; *Andhra Pradesh*, INDIA; 16°33′N, 79°16′E; collected 2 Nov. 1963 by B. Nath (Chaturvedi, [1973], p. 17; letter, 29 Sept. 1978; Subrahmanyam, 1975, p. xvii; Agrawal & Bhatiacharyya, 1976, p. 213); ZSI, 1 (skin only). A:I-129.

Sijian Shan Water Regulation Forest Reserve; *Guangxi*, CHINA ca. 25°12′N, 108°57′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 128; letter, Aug. 1996). C:C-180.

Sikarwar. See Khair, Tahsil.

Sikkim, INDIA; ca. 27°10′N, 88°30′E; collected before 1892 by [L. Mandelli] (Blanford, 1888b, p. 14); BM (NH), 2 (skins only, 1 with skull inside). B:I-7.

Siliguri; *West Bengal*, INDIA 26°42′N, 88°26′E; observed in 1962 by C. H. Southwick, A. Ghosh, and C. D. Louch (1964, p. 444). B:I-6.

Simao Xian; *Yunnan*, CHINA; ca. 22°46′N, 101°05′E; tissue samples obtained ca. 1991 by Zhang Yaping and Shi Liming (1993b, p. 589). Immunological survey conducted before 1996 by Duan Xingsheng, Liu Yuanwei, Wu Jing, Dao Weiying, and Liu Jianghai (1995, p. 411). B:C-78.

Simla, western suburb, 1800–2200 m; *Himachal Pradesh*, INDIA; 31°06′N, 77°10′E; observed Aug. 1972–Jan. 1973 by Y. Sugiyama (1976, p. 262). A:I-18.

Simla District; *Himachal Pradesh*, INDIA; 30°45′–31°10′N, 76°55′–77°15′E; observed 1981–1983 by P. K. Seth, S. Seth, G. L. Reddy, and P. K. Chopra (1992, p. 62). Not mapped (see A:I-18).

Simla vicinity, 8000 ft (= 2440 m); *Himachal Pradesh*, INDIA; ca. 31°06′N, 77°10′E; observed May 1911 by P. T. L. Dodsworth (1914, p. 730). Collected 5 Sept. 1913 by P. T. L. Dodsworth (1914, p. 730); BNHS, 1 (skull only). Observed Aug. 1972–Feb. 1973 by K. Wada (1984, p. 477). Observed Dec. 1981–Feb. 1982 by A. Camperio Ciani (1983, p. 275; 1984, p. 372). Observed Apr.–May 1991 by C. Ross, A. Srivastava, and R. S. Pirta (1993, p. 160). A:I-18.

Simla Water Catchment Reserve; *Himachal Pra-*

desh, INDIA; ca. 31°05′N, 77°10′E; reported 1978–1980 by A. J. Gaston, P. J. Garson, and M. L. Hunter, Jr. (1983, p. 300). A:I-18.

Simri, Birganj Forest District; *Rautahat*, NEPAL; 27°06′N, 85°14′E; observed June 1964–Dec. 1965 by D. L. Chesemore (1970, p. 164). A:N-13.

Simri, Narayani River, Rapti Valley; *Chitawan*, NEPAL; 27°36′N, 84°19′E; observed June 1964–Dec. 1965 by D. L. Chesemore (1970, p. 164). Reported at Chitwan National Park before 1997 by K. K. Gurung and R. Singh (1996, p. 84). A:N-8.

Simulbari-Pankhabari, highway between; *West Bengal*, INDIA; ca. 26°48′N 88°18′E; observed Mar.–Apr. 1985 by R. P. Mukherjee, S. Chaudhuri, and A. Murmu (1995, p. 27). B:I-6.

Sindholi (= Sindhauli); *Uttar Pradesh*, INDIA; 27°52′N, 78°07′E; observed 1959–1975 by C. H. Southwick and M. F. Siddiqi (1977, p. 342). A:I-69.

Singaul, Tekan, Birganj Forest District; *Rautahat*, NEPAL; 27°10′N, 85°20′E; observed June 1964–Dec. 1965 by D. L. Chesemore (1970, p. 164). A:N-13.

Singaw. See Tanga-Shingaw.

Singhbhum. See Luia.

Singkaling Hkamti, upper Chindwin River; *Kachin*, MYANMAR (= BURMA); ca. 26°00′N, 95°42′E; collected June–Aug. 1914 by G. C. Shortridge (in Wroughton, 1916a, p. 293). BM(NH), 3 (including 2 skulls only). B:M-8.

Singkaling Hkamti, upper Chindwin River, 500 ft (= 150 m); *Kachin*, MYANMAR (= BURMA); ca. 26°00′N, 95°42′E; collected 5 Aug. 1914 by G. C. Shortridge and S. A. Macmillan (in Wroughton, 1916a, p. 293); BNHS, 1. B:M-8.

Singkaling Hkamti, upper Chindwin River, left (east) bank, 500 ft (= 150 m); *Kachin*, MYANMAR (= BURMA); ca. 26°00′N, 95°42′E; collected 24 July 1914 by G. C. Shortridge and S. A. Macmillan (in Wroughton, 1916a, p. 293); ZSI, 1. B:M-8.

Singkaling Hkamti, upper Chindwin River, right (west) bank; *Kachin*, MYANMAR (= BURMA); ca. 26°00′N, 95°42′E; collected 8 Mar. 1935 by H. C. Raven (in Carter, 1943, p. 100; Morris, 1936, p, 662); AMNH, 1. B:M-8.

Singolo. See Xi Golog.

Sita Bani, Ramnagar vicinity, Kumaun region, 2000 ft (= 600 m); *Uttar Pradesh*, INDIA; 29°24′N, 78°13′E; collected 22 Nov. 1913 by C. A. Crump (in Wroughton, 1914, p. 283); BM(NH), 2. A:I-34.

Sitakunda; *Chittagong*, BANGLADESH; 22°37′N, 91°39′E; observed Feb. 1990–June 1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, p. 76). B:Ba-32.

Sitapahar/Rampahar; *Rangamati*, BANGLADESH; ca. 22°30′N, 92°15′E; reported early in 1980 by S. P. Gittins and A. W. Akonda (1982, p. 278). B:Ba-35.

Sitapur-Bareilly, highway between; *Uttar Pradesh*, INDIA; ca. 27°50′N, 80°00′E; observed 28 Oct.–29 Dec. 1964 by C. H. Southwick, D. Lindburg, M. Neville, P. Jay, and R. P. Mukherjee (Southwick and M R. Siddiqi, 1966, p. 306). A:I-54.

Sitapur-Shahjahanpur, highway between; *Uttar Pradesh*, INDIA; ca. 27°40′N, 80°20′E; observed 1964–1965 by R. P. Mukherjee and G. D. Mukherjee (1972, p. 67). A:I-67.

Sittang River. See Toungoo, 15 mi. (= 24 km) north of.

Siva (= Shiva); *Dhankuta*, NEPAL; 27°28′N, 87°10′E; observed in 1997 by M. K. Chalise and M. Ghimire (1998, p. 12). B:N-supplementary.

Sivalik Hills. See Siwalik Range.

Sivok; *West Bengal*, INDIA; 26°52′N, 88°27′E; collected 11 Nov. 1930 by H. Stevens; FMNH, 1 (skin only). B:I-6.

Sivok, ca. 3 km east of; *West Bengal*, INDIA; ca. 26°52′N, 88°30′E; observed Mar.–Apr. 1985 by R. P. Mukherjee, S. Chaudhuri, and A. Murmu (1995, p. 27). B:I-6.

Sivok, ca. 5 km east of; *West Bengal*, INDIA; ca. 26°52′N, 88°31′E; observed Mar.–Apr. 1985 by R. P. Mukherjee, S. Chaudhuri, and A. Murmu (1995, p. 27). B:I-6.

Sivok, ca. 6 km east of; *West Bengal*, INDIA; ca. 26°52′N, 88°32′E; observed Mar.–Apr. 1985 by R. P. Mukherjee, S. Chaudhuri, and A. Murmu (1995, p. 27). B:I-6.

Siwalik Range; *Himachal Pradesh*, INDIA; 30°20′–32°10′N, 75°40′–77°40′E; observed 9 Aug.–13 Sept. 1974 by M. Singh (1975, p. 472). Not mapped.

Sohagpur, Hoshangabad District, 1000 ft (= 300 m); *Madhya Pradesh*, INDIA; 22°42′N, 78°12′E; collected 10 Apr. 1912 by C. A. Crump (Wroughton & Ryley, 1913, p. 45); BM(NH), 1 (skin only). A:I-95.

Solon (= Solan) District; *Himachal Pradesh*, INDIA; ca. 30°55′N, 77°07′E; observed 1981–1983 by P. K. Seth, S. Seth, G. L. Reddy, and P. K. Chopra (1992, p. 62). A:I-18.

Sonargaon; *Narayanganj*, BANGLADESH;

23°39′N, 90°37′E; reported in 1971 by J. R. Oppenheimer, A. K. Akonda, and K. Z. Husain (1983, p. 194). B:Ba-27.

Sonepat District; *Haryana*, INDIA; ca. 28°59′N, 77°01′E; observed 1981–1983 by P. K. Seth, S. Seth, G. L. Reddy, and P. K. Chopra (1992, p. 62). A:I-36.

Songtao; *Guizhou*, CHINA; 28°12′N, 109°12′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-114.

Song-Ta-Voy (= Song-Ta-Voi); *Quang Nam-Da Nang*, VIETNAM; ca. 16°10′N, 107°40′E; collected [?Jan. 1899] by P. F. S. Barthélemy (1904, p. 38); MNHN, 1. C:V-34.

Songxi Xian; Fujian, CHINA; ca. 27°36′N, 118°47′E; reported Oct. 1980 by Zheng Xueqing (1984, p. 146). C:C-74.

Son La; VIETNAM; ca. 20°35′–22°05′N, 103°15′–105°00′E; collected before 1986 by unknown collector (Dao, 1985, p. 166); museum unknown (not seen). Not mapped.

Son Tra, Mt.; *Quang Nam-Da Nang*, VIETNAM; ca. 16°07′N, 108°18′E; collected 20 Aug. 1965 at >400 m by P. F. Ryan (Van Peenen et al., 1968, p. 609; 1971, pp.127, 134; Fooden, 1995, p. 25); USNM, 1 (skull only, external measurements in collector's fieldbook). Collected 19 May 1966 by J. T. Lowery (Van Peenen et al., 1968, p. 609; 1971, pp. 127, 134; Fooden, 1995, p. 25); USNM, 1 (skull only, mandible missing). Reported ca. 1990–1995 by L. K. Lippold (1995, p. 199; identified as *M. fascicularis*). C:V-36.

Son Tra, Mt., 3.9 km west and 0.3 km south of; 240 m; *Quang Nam-Da Nang*, VIETNAM; ca. 16°07′N, 108°15′E; collected 14 Sept. 1967 by P. F. D. Van Peenen (Van Peenen et al., 1968, p. 609; 1971, pp. 127, 134; Fooden, 1995, p. 25); USNM, 1 (external measurements questionable). C:V-36.

South China. See CHINA, South.

South District, north-central; *Tripura*, INDIA ca. 23°45′N, 91°35′E; observed in 1976 and 1978 by R. P. Mukherjee (1982, p. 71). Observed May–Aug. 1989 by A. K. Gupta (1994, p. 102). B:I-40.

South District, northeastern; *Tripura*, INDIA; ca. 23°35′N, 91°55′E; observed in 1976 and 1978 by R. P. Mukherjee (1982, p. 71). Observed May–Aug. 1989 by A. K. Gupta (1994, p. 102). B:I-42.

South District, south-central; *Tripura*, INDIA; ca. 23°05′N, 91°40′E; observed in 1976 and 1978 by R. P. Mukherjee (1982, p. 71). Observed May–Aug. 1989 by A. K. Gupta (1994, p. 102). B:I-40.

South District, southeastern; *Tripura*, INDIA; ca. 23°05′N, 91°48′E; observed in 1976 and 1978 by R. P. Mukherjee (1982, p. 71). Observed May–Aug. 1989 by A. K. Gupta (1994, p. 102). B:I-40.

South District, southwestern; *Tripura*, INDIA; ca. 23°00′N, 91°35′E; observed in 1976 and 1978 by R. P. Mukherjee (1982, p. 71). Observed May–Aug. 1989 by A. K. Gupta (1994, p. 102). B:I-40.

South District, west-central; *Tripura*, INDIA; ca. 23°20′N, 91°30′E; observed in 1976 and 1978 by R. P. Mukherjee (1982, p. 71). Observed May–Aug. 1989 by A. K. Gupta (1994, p. 102). B:I-40.

South Kamrup. See Kulsi; Rajapara.

"Southwest" *Yunnan*. See *Yunnan* [northwestern].

Srimangal Tea Estate; *Moulvi Bazar*, BANGLADESH; ca. 24°19′N, 91°44′E; observed Feb. 1990–June 1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, p. 76). B:Ba-13.

Srimangal vicinity; *Moulvi Bazar*, BANGLADESH; ca. 24°19′N, 91°44′E; tentatively reported July–Nov. 1976 by K. M. Green (1978, p. 146). B:Ba-13.

Srinagar, ca. 22 km southeast of. See Ovra (= Overa) Sanctuary.

Suifu. See Yibin.

Suiyang; *Guizhou*, CHINA; 27°57′N, 107°11′E; reported before 1988 (Zhang et al., 1997, p. 58). C:C-130.

Sucktaisgur. See Saktesgarh.

Sukla Phanta; *Kanchanpur*, NEPAL; 28°50′N, 80°11′E; observed June 1964–Dec. 1965 by D. L. Chesemore (1970, p. 164). Reported before 1997 by K. K. Gurung and R. Singh (1996, p. 118). Observed in 1998 by M. K. Chalise and M. Ghimire (1998, p. 12). A:N-2.

Sukna, Darjeeling District; *West Bengal*, INDIA; 26°47′N, 88°22′E; collected 25 Apr. 1892 by W. Partridge; ZSI, 1. Observed in 1962 by C. H. Southwick, A. Ghosh, and C. D. Louch (1964, p. 446). Observed Mar.–Apr. 1985 by R. P. Mukherjee, S. Chaudhuri, and A. Murmu (1995, p. 27). B:I-6.

Sukna-Kurseong, highway between; *West Bengal*, INDIA; ca. 26°48′N, 88°21′E; observed Mar.–Apr. 1985 by R. P. Mukherjee, S. Chaudhuri, and A. Murmu (1995, p. 27). B:I-6.

Sultanpur vicinity; *Uttar Pradesh*, INDIA; ca. 26°16′N, 82°04′E; blood samples obtained 16–

27 Apr. 1964 by K. V. Shah and C. H. Southwick (1965, p. 489). A:I-64.

Sumera; *Uttar-Pradesh*, INDIA; ca. 28°02′N, 78°09′E; observed Jan. 1990–Mar. 1991 by E. Imam and H. S. A. Yahya (1995, p. 2). A:I-69.

Sumera Fall Jungle; *Uttar Pradesh*, INDIA; ca. 28°02′N, 78°09′E; observed 1959–ca. 1980 by C. H. Southwick and M. F. Siddiqi (1977, p. 342; 1984, p. 559; Siddiqi & Southwick, 1980, p. 54; 1988, p. 121). A:I-69.

Sundarbans (= Sunderbans; Sunderbunds); *Khulna*, BANGLADESH; ca. 22°00′N, 89°30′E; observed 29 Jan.–21 Apr. 1971 by H. Hendrichs (1975, p. 177). Tentatively reported July–Nov. 1976 by K. M. Green (1978, p. 146). Reported before 1978 (Anonymous, 1977, p. 14). Observed early in 1980 by S. P. Gittings and A. W. Akonda (1982, p. 278). Observed in 1980 and 1982 by M. A. R. Khan and M. F. Ahsan (Khan, 1985, p. 31; 1986, p. 37). Observed Feb. 1990–June 1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, pp. 76, 79). Reported before 1997 by K. K. Gurung and R. Singh (1996, p. 122). B:Ba-23.

Sundarbans (= Sunderbans, Sunderbunds); *West Bengal*, INDIA; 88°00′–89°00′N, 21°30′–22°30′E; reported in 1892 by E. de Poncins (1935, p. 846). Reported before 1997 by K. K. Gurung and R. Singh (1996, p. 122). Not mapped (see B:I-1 and B:I-2).

Sundarbans (= Sunderbunds), ca. 50 mi (= 80 km) east of Calcutta; *Satkhira*, BANGLADESH; ca. 22°35′N, 89°15′E; collected 26 Apr. 1870 by museum collector (Anderson,1872, p. 529); ZSI 7 (including 1 skin only). B:Ba-21.

Sungri, ca. 2 km south of; *Himachal Pradesh*, INDIA; ca. 31°18′N, 77°42′E; observed Aug. 1972–Feb. 1973 by K. Wada (1984, p. 476). A:I-17.

Sungri, ca. 4 km north of; *Himachal Pradesh*, INDIA; ca. 31°21′N, 77°42′E; observed Aug. 1972–Feb. 1973 by K. Wada (1984, p. 476). A:I-17.

Sungri, ca. 6 km northwest of; *Himachal Pradesh*, INDIA; ca. 31°21′N, 77°39′E; reported Aug. 1972–Feb. 1973 by K. Wada (1984, p. 476). A:I-17.

Sungri, ca. 10 km northwest of; *Himachal Pradesh*, INDIA; ca. 31°23′N, 77°38′E; reported Aug. 1972–Feb. 1973 by K. Wada (1984, p. 476). A:I-17.

Sungri, ca. 10 km southwest of; *Himachal Pradesh*, INDIA; ca. 31°14′N, 77°37′E; reported Aug. 1972–Feb. 1973 by K. Wada (1984, p. 476). A:I-17.

Sungri, ca. 15 km southwest of; *Himachal Pradesh*, INDIA; ca. 31°14′N, 77°33′E; reported Aug. 1972–Feb. 1973 by K. Wada (1984, p. 476). A:I-17.

Sungri, ca. 20 km south-southwest of; *Himachal Pradesh*, INDIA; ca. 31°08′N, 77°38′E; observed Aug. 1972–Feb. 1973 by K. Wada (1984, p. 476). A:I-17.

Sungri, north of; *Himachal Pradesh*, INDIA; ca. 31°19′N, 77°42′E; observed Aug. 1972–Feb. 1973 by K. Wada (1984, p. 476). A:I-17.

Suoxi Valley (= Suoxiyu), Cili Xian, 1256 m; *Hunan*, CHINA; ca. 29°55′N, 110°50′E; reported before 1986 by Di Chen (1985, p. 33). Observed 1988–1990 by Feng Min, Jiang Haisheng, and Wang Jun (1997, p. 25). C:C-110.

Surat. See Dangs District.

Surinsar, Samba Subdistrict; *Jammu & Kashmir* INDIA; ca. 32°34′N, 75°07′E; observed before 1983 by Y. R. Malhotra and D. N. Sahi (1982, p. 27). A:I-7.

Suritola. See Dhaka.

Swat Khoistan region; *North-West Frontier*, PAKISTAN; ca. 35°35′N, 72°30′E; reported before 1978 by T. J. Roberts (1977, pp. 86, 87). A:P-3.

Swat River; *North-West Frontier*, PAKISTAN; ca. 34°20′N, 71°35′E; blood samples collected ca. 1978–1979 by D. J. Melnick, C. J. Jolly, and K. K. Kidd (1986, p. 129). A:P-5.

Swat Valley, lower. See Bar Chanrai Hill.

Swayambhunath, 4400 ft (= 1300 m); *Katmandu Valley*, NEPAL; ca. 27°43′N, 85°18′E; observed June 1964–Dec. 1965 by D. L. Chesemore (1970, p. 164). Observed 1974–1975 by H. Taylor, J. Teas, T. Richie, C. Southwick, and R. Shrestha (1978, p. 344).Observed 1975–1978 by J. Teas (1983, p. 224). Reported before 1982 by T. K. Shrestha (1981, p. 269). Observed summer 1982 by R. L. Johnson and C. H. Southwick (1984, p. 201). Observed 1995–1998 by M. K. Chalise and M. Ghimire (1998, p. 11). A:N-12.

Sylhet Forest Division; *Moulvi Bazar*, BANGLADESH; ca. 24°25′N, 92°00′E; reported before 1982 by M. A. R. Khan (1981, p. 13). B:Ba-13.

Szechuan. See Sichuan.

Szechuen. See Sichuan.

Tachienlu. See Kangding.

Ta Chang Tai. See Tha Chang Tai.

Taga Hka, Chindwin River, west bank; *Kachin*, MYANMAR (= BURMA); 26°21′N, 96°09′E;

collected 11 Feb. 1935 by R. C. Morris and C. McCann (Morris, 1936, pp. 653, 655; H. C. Raven in Carter, 1943, p. 100); AMNH, 2. B:M-7.

Taihang Shan; *Henan*, CHINA; ca. 35°05′N, 112°24′E; observed 1988–1995 by Fang Baohua, Xu Xinjie, and Liu Bingxu (1995, p. 355; cf. Chen et al., 1988, p. 25). C:C-4.

Taihe; *Jiangxi*, CHINA; 26°48′N, 114°56′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-105.

Taining, Wuyishan; *Fujian*, CHINA; 26°55′N, 117°12′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-81.

Taining Xian; *Fujian*, CHINA; ca. 26°55′N, 117°12′E; reported May 1981 by Zheng Xueqing (1984, p. 145). C:C-81.

Tai Po Kau Nature Reserve: *Xianggang* (= *Hong Kong*), CHINA; ca. 22°25′N, 114°10′E; reported before 1992 by J. R. Fellowes (1992, p. 131). C:C-210.

Tai Tam Reservoir; *Xianggang* (= *Hong Kong*), CHINA; ca. 22°14′N, 114°13′E; reported in 1947 by G. A. C. Herklots (1951, p. 83). C:C-210.

Takerhat. See Dhaka.

Tallada, Khammam District, 100 m; *Andhra Pradesh*, INDIA; 17°13′N, 80°25′E; observed 21 Apr. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 467). A:I-132.

Tal Vraksh, Tahsil Kushalgarh; *Rajasthan*, INDIA; ca. 23°10′N, 74°27′E; observed 1975–1980 by P. K. Seth, S. Seth, and A. K. Shukla (1983, p. 38). A:I-97.

Tamanthe. See Hisweht.

Tamanthi Wildlife Sanctuary; *Sagaing*, MYANMAR (= BURMA); 25°26′N, 95°37′E; observed 2–14 Mar. 1994 by A. Rabinowitz, G. B. Schaller, and U Uga (1995, p. 125). B:M-11.

Tanbazar. See Narayanganj.

Tang Hpre (= Tang Hper); *Kachin*, MYANMAR (= BURMA); ca. 25°23′N, 97°14′E; collected 14 Oct. 1945 by K. E. Stager (letter, 9 Aug. 1985); USNM, 1. B:M-5.

Tanga-Shingaw (= Tang-Singaw), road between, 800 ft (= 240 m); *Kachin*, MYANMAR (= BURMA); ca. 25°40′N, 97°55′E; collected 9 Apr. 1939 by H. E. Anthony (1941, pp. 55, 83); AMNH, 1. B:M-4.

Tangxi, Guichi Xian, 200–560 m; *Anhui*, CHINA; ca. 30°20′N, 117°40′E; observed 1973–1986 by Xiong Chenpei (Wada et al., 1986, p. 83). C:C-50.

Tanikella, Khammam Taluk, Khammam District; *Andhra Pradesh*, INDIA; 17°15′N, 80°15′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 19). A:I-132.

Tanti Road. See Dhaka.

Tara Devi. See Nhera/Tara Devi.

Tarai. See Terai.

Tarap; *Moulvi Bazar*, BANGLADESH; ca. 24°10′N, 91°35′E; observed early in 1980 by S. P. Gittins and A. W. Akonda (1982, p. 278). B:Ba-13.

Tarkhola, Darjeeling District, 325 m; *West Bengal*, INDIA; 27°07′N, 88°33′E; observed June–Aug. 1958 by H. Khajuria (1966, p. 284; Khajuria & Ghose, 1970, p. 17). B:I-7.

Taro (?= Dalu); *Kachin*, MYANMAR (= BURMA); 26°21′N, 96°11′E; collected 5 Feb. 1935 by H.C. Raven (in Carter, 1943, p. 100; Morris, 1936, p. 653); AMNH, 2. B:M-7.

Tasin Lou. See Kangding.

Tat Ke vicinity (= Kheo Ting-Ta Ke area), Na Hang District; *Tuyen Quang*, VIETNAM; ca. 22°25′N, 105°25′E; captured ca. 1992 by local resident (Ratajszczak et al., 1992, p. 14). C:V-6.

Tatkon, near Kindat, east bank of Chindwin River, 250 ft (= 75 m); *Sagaing*, MYANMAR (= BURMA); ca. 23°47′N, 94°30′E; collected 5 July 1914 by G. C. Shortridge and S. A. Macmillan (Shortridge in Wroughton, 1916a, p. 293); BNHS, 1. B:M-18.

Tatkon, near Kindat, west bank of Chindwin River, 250 ft (= 75 m); *Sagaing*, MYANMAR (= BURMA); 23°47′N, 94°29′E; collected 28 June and 5 July 1914 by G. C. Shortridge (in Wroughton, 1916a, p. 293); BM(NH), 2 (including 1 skin only); BNHS, 2 (including 1 skin only). B:M-18.

Ta-tsien-lou. See Kangding.

Tatura, Chandigarh; *Punjab*, INDIA; not precisely located, 30°38′–30°47′N, 76°43′–76°53′E; reported 1964–1966 by D. G. Lindburg (1977a, p. 268). Not mapped.

Tay Tru. See Trai Tru.

Tché-ly, eastern mountains. See Xinglong Xian, southern.

Tehri-Garhwal District; *Uttar Pradesh*, INDIA; ca. 30°23′N, 78°29′E; observed 1981–1983 by P. K. Seth, S. Seth, G. L. Reddy, and P. K. Chopra (1992, p. 62). A:I-28.

Teknaf Peninsula; *Cox's Bazar*, BANGLADESH; 20°52′N, 92°18′E; observed Feb. 1990–June 1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, p. 76). B:Ba-40.

Tenali, 5.5 km west of, Guntur District, 10 m; *Andhra Pradesh*, INDIA; 16°14′N, 80°37′E;

observed 10 May 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 468). A:I-143.

Tenasserim; MYANMAR (= BURMA); 10°–15°N, 98°–100°E; obtained 4 Oct. 1912 by Sch. Med. Rat. Dönitz; locality information probably inaccurate (see above, Fig. 2B); ZMB, 1 (skull only). Not mapped.

Tengchong (= Momien); *Yunnan*, CHINA; 25°02′N, 98°28′E; captive purchased Mar.–July 1868 by J. Anderson (1876, pp. 190, 247; 1879, pp. xvi, 56); ZSI, 1 (skin only). Collected 5 Jan. 1961 by Zhou Jiadi; IZCAS, 1 (skin only). B:C-59.

Tengchong Xian; *Yunnan*, CHINA; ca. 25°02′N, 98°28′E; collected before 1984 by Ma Shilai; KIZ, 1 (skull only). B:C-59.

Tengri-Nor. See Nam Co.

Teng-yue-chow. See Tengchong.

Teng-yueh. See Hui-yao.

Ten Ky. See Nghia Dung.

Terai (region); NEPAL; 26°–29°N, 80°–88°E; reported before 1842 by B. H. Hodgeson (1841, p. 1212; cf. Karan, 1960, p. 92). Not mapped.

Tha Chang Tai (= Ta Chang Tai), 600 ft (= 180 m); *Tak*, THAILAND; 16°51′N, 99°03′E; collected 14 July 1924 by J. H. Chambrai (Kloss, 1930, p. 62); ZRC, 1 (excludes ZRC 4–822, a colobine: cf. Weitzel et al., 1988, p. 116). B:T-7.

Thai Nguyen; *Bac Thai*, VIETNAM; ca. 21°36′N, 105°50′E; collected 30 Dec. 1956 and 17 June 1959 by unknown collectors; ZMVNU, 2 (skulls only). C:V-15.

Thana Ghazi. See Bandipul.

Thanh Son; *Vinh Phu*, VIETNAM; 21°13′N, 105°11′E; collected 27 June 1961 by unknown collector; ZMVNU, 1 (skull only). C:V-18.

Thanh Tuong, Na Hang District; *Tuyen Quang*, VIETNAM; 22°19′N, 105°24′E; collected 18 Jan. 1965 and 23 Octt. 1965 by Ma Van Dam (Dao, 1985, p. 29; external measurements published); IEBR, 2. C:V-6.

Thapathali. See Tripureswor.

Tharikella. See Tanikella.

Thateng. See Muang Thateng.

Theme. See Pye (= Prome), 35 mi (= 55 km) southeast of.

Thirumunidevipetta. See Tirumaladevipeta.

Thuong Bang La, Van Chan District; *Yen Bai*, VIETNAM; 21°25′N, 104°47′E; collected Mar. 1963 by unknown collector (Dao, 1985, pp. 183, 192); IEBR, 1 (skull only). C:V-17.

Tian'e Xian; *Guangxi*, CHINA; ca. 25°00′N, 107°10′E; purchased at traditional medicine shop 15 Oct. 1992 by Quan Guoqiang (cf. Fooden et al., 1994, p. 623); IZCAS, 3 (skulls only). C:C-173.

Tiantang Shan Water Regulation Forest Reserve; *Guangxi*, CHINA; ca. 22°36′N, 110°42′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 129; letter, Aug. 1996). C:C-214.

Tibet; *Sichuan* or *Xizang* (= *Tibet*), CHINA; 30°–32°N, 96.5°–102°E; collected [May–July 1890] by G. Bonvalot and H. d'Orleans (Bonvalot, 1891, vol. 2, p. 210; 1892, p. 505); possibly purchased at Ngamda (?= Kintachié/Houmda) and/or collected at Rouétoundo (see above; Bonvalot, 1891, vol.2, pp. 149, 156); MNHN, 2 (skins only). Not mapped.

Tibet Colony. See Dehra Dun vicinity.

Tin Toc Forest, Moc Chau Plateau, 900 m; *Son La*, VIETNAM; ca. 20°50′N, 104°46′E; collected 20 Jan. 1970 by Le Vo Dinh Tuong (Dao, 1978, pp. 378, 382); museum unknown, 2 (not seen). C:V-19.

Tinsukia District (Bherjan, Borajan, Podumoni Reserved Forests); *Assam*, INDIA; ca. 27°30′N, 95°22′E; observed Sept.–Nov. 1995 by A. Choudhury (1997, p. 10). B:I-26.

Tipomia; *Assam*, INDIA; ca. 27°00′N, 94°48′E; reported 9 Mar. 1987–16 Feb. 1988 by A. Choudhury ([1991a], p. 31). B:I-25.

Tipusultan Road. See Dhaka.

Tirthan; *Himachal Pradesh*, INDIA; ca. 31°40′N, 77°30′E; reported 1978–1980 by A. J. Gaston, P. J. Garson, and M. L. Hunter, Jr. (1983, p. 300). A:I-16.

Tirumaladevipeta, Chintalapudi Taluk, West Godavari District; *Andhra Pradesh*, INDIA; 17°05′N, 81°09′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 19). A:I-137.

Tongjiang Xian; *Sichuan*, CHINA; ca. 31°55′N, 107°13′E; collected July 1966 by Expedition of Biological and Agricultural Resources in Qinling, Shaanxi; SIZ, 4. C:C-31.

Tong Kou; *Anhui*, CHINA; ca. 30°05′N, 118°10′E; collected 23 May and 21 July 1959 by Wang Zeyeh; IZCAS, 2 (including 1 skin only). C:C-62.

Tong-lin, mountains of. See Xinglong Xian, southern.

Tongzhi. See Tongzi.

Tongzi (= Tongzhi); *Guizhou*, CHINA; 28°08′N, 106°49′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-135.

Tonkin region; VIETNAM; 20°–23°N, 102°–108°E; captive obtained in 1886 by Lt. Stahl;

died in zoo 26 Jan. 1887; MNHN, 1 (skin only). Not mapped.

Toungoo, 13 mi (= 21 km) east of, 500 ft (= 150 m); *Karen*, MYANMAR (= BURMA); ca. 18°55′N, 96°40′E; collected 2 Sept. 1927 by J. M. D. Mackenzie (in Fry, 1929, p. 637); BM (NH), 1; BNHS, 1. B:M-31.

Toungoo, 15 mi (= 24 km) north of, east side of Sittang River, 400 ft (= 120 m); *Karen*, MYANMAR (= BURMA); ca. 19°10′N, 96°25′E; collected 26 Jan. 1927 by J. M. D. Mackenzie (Fry, 1928, P. 545); BM(NH), 1. B: M-30.

Toungoo, 20 mi (= 32 km) west of, 500 ft (= 150 m); *Pegu*, MYANMAR (= BURMA); ca. 18°55′N, 96°08′E; collected 22 Feb. 1929 by J. M. D. Mackenzie; BNHS, 1 (skin only). B:M-33.

Toungoo, 30 mi (= 48 km) northwest of, 500 ft (= 150 m); *Pegu*, MYANMAR (= BURMA); ca. 19°15′N, 96°05′E; collected 26 Nov. and 6 Dec. 1928 by J. M. D. Mackenzie (Khajuria, [1955], p. 113); BM(NH), 1; BNHS, 1; ZSI, 1 (skin only). B:M-29.

Toungoo, east side of Sittang River, 100 ft (= 30 m); *Pegu*, MYANMAR (= BURMA); ca. 18°56′N, 96°27′E; collected 15 May 1927 by J. M. D. Mackenzie (in Fry, 1929, p. 637); BM(NH), 3. B:M-32.

Trai Tru (= Tay Tru), Huong Khe District; *Ha Tinh*, VIETNAM; 18°11′N, 105°35′E; collected 6 Feb. 1964 by unknown collector (Dao, 1985, p. 233; external measurements published); IEBR, 1 (skull only). C:V-28.

Tripureswor, Thapathali; *Katmandu Valley*, NEPAL; ca. 27°43′N, 85°19′E; observed Dec. 1995 and Dec. 1998 by M. K. Chalise and M. Ghimire (1998, pp. 12, 15). A:N-supplementary.

Trisuli Bazar, 4 mi (= 6.5 km) southeast of, Nawakot District, 1875 ft (= 570 m); *Bagmati*, NEPAL; ca. 27°55′N, 85°10′E; collected 9 and 13 Apr. 1967 by C. O. Maser; FMNH, 6 (3 skeletons only, 3 in alcohol); UPS, 2 (in alcohol, not seen). A:N-11.

Trung Khanh District, *Cao Bang*, VIETNAM; ca. 22°50′N, 106°31′E; collected 9 May 1967 by Hoang Tung; FCXM, 1 (skull only, mandible missing). C:V-9.

Tsari Chu (= Tsari Valley); *Xizang* (= *Tibet*), CHINA; ca. 28°45′N, 93°10′E; observed Sept.–Oct. 1913 by F. M. Bailey (1914, map; 1915, p. 74). B:C-5.

Tseo-Jia-Geo; *Sichuan*, CHINA; ca. 28°18′N, 104°12′E; collected 14 Jan. 1931 by D. G. Graham (Moore & Tate, 1965, p. 334); USNM, 1. C: C-138.

Tsingtau. See *Sichuan*.

Tsung he. See Luofu Shan.

Tu Chi; VIETNAM; not located, 15°–23°N, 102°–109°E; date and collector unknown; ZMVNU, 1 (skull only). Not mapped.

Tughlaqabad (= Tughlakabad; Tukhlabad); *Delhi*, INDIA; ca. 28°30′N, 77°15′E; observed 1964–1965, Dec. 1970–July 1972, Mar. 1980–Aug. 1983, and July–Aug. 1987 by I. Malik, P. K. Seth, and C. H. Southwick (1984, p. 312; Southwick and M. R. Siddiqi, 1966, p. 309; Southwick et al., 1976, p. 13; Malik, 1989a, p. 118). Observed May 1987–Feb. 1989 by R. L. Johnson, I. Malik, and C. M. Berman (1991, p. 339). A:I-41.

Tunchang Xian; Hainan Dao; *Hainan*, CHINA; ca. 19°22′N, 110°05′E; reported before 1986 by Xu Longhui and Liu Zhenhe (1985, p. 148). C: C-230.

Tungho. See Wa Shan.

Tunki, Gajwel Taluk, Medak District; *Andhra Pradesh*, INDIA; 17°45′N, 78°34′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18). A:I-123.

Tung Ling. See Xinglong Xian, southern.

Tunxi; *Anhui*, CHINA; 29°43′N, 118°19′E; collected 23 Jan. 1959 by museum collector; SMNH, 1 (skin only). C:C-61.

Tusu River. See Hisweht.

Tuzu River. See Hisweht.

Twenty-four Parganas District; *West Bengal*, INDIA; 21°30′–22°20′N, 88°00′–89°00′E; observed 1951–1961 by A. K. Mandal (1964, P. 165). Not mapped (see B:I-1 and B:I-2).

U, Nam. See Ou, Nam.

Udhampur; *Jammu & Kashmir*, INDIA; 32°56′N, 75°08′E; observed before 1983 by Y. R. Malhotra and D. N. Sahi (1982, p. 27). A:I-10.

Ukhia; *Cox's Bazar*, BANGLADESH; 21°15′N, 92°08′E; observed Feb. 1990–June 1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, p. 76). B:Ba-39.

Umri Devi, Tahsil Ramgarh; *Rajasthan*, INDIA; ca. 27°15′N, 75°11′E; Observed 1975–1980 by P. K. Seth, S. Seth, and A. K. Shukla (1983, p. 38). A:I-76.

Undrajapuram, Peravalli Block, East Godavari District; *Andhra Pradesh*, INDIA; not precisely located, 16°40′–17°50′N, 81°30′–82°35′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 19). Not mapped.

United Khasi-Jaintia Hills; *Meghalaya*, INDIA;

ca. 25°30′N, 91°30′E; reported Dec. 1972–Feb. 1973 by R. L. Tilson (1983, p. 399). B:I-14.

Um Pang. See Ban Umphang.

Umpilagudem. See Dumpallagudem.

Uppadhyay Mohalla. See Khair, Tahsil.

Utzun Vicinity, Chitral District 5000 ft (= 1500 m); *North-West Frontier*, PAKISTAN; ca. 35°30′N, 71°40′E; reported 1901–1902 by H. Fulton (1903, p. 758). Reported before 1978 by T. J. Roberts (1977, p. 86). A:P-1.

Uzipur. See Wazipur.

Vaddeppalli. See Waddepalle.

Van Canh, Dao; *Quang Ninh*, VIETNAM; ca. 20°52′N 107°22′E; collected 3 Apr. 1969 and June 1969 by unknown collectors; IEBR, 2 (skulls only). C:V-13.

Van Hai, Dao; *Quang Ninh*, VIETNAM; 20°54′N, 107°30′E; collected Dec. 1961 by Xin Cua Dan (C. Groves, letter, 15 Dec. 1994) and unknown collector; ZMVNU, 2 (skins only). Collected Dec. 1961 by Thanh, Khoi, and Cong; ZMVNU, 1 (skull only). C:V-13.

Varanasi (= Benares); *Uttar Pradesh*, INDIA; 25°20′N, 83°00′E; observed Sept. 1959-Feb. 1960 and 1964–1965 by C. H. Southwick, M. A. Beg, and M. R. Siddiqi (1961a, p. 543; Southwick & M. R Siddiqi, 1966, p. 312). Observed Aug. 1977–July 1978 by R. S. Pirta (1982, p. 401; Pirta & Singh, 1982, p. 15). Observed 2 Apr.–30 July 1980 and 15 Mar.–30 July 1981 by R. K. Singh (1984, p. 430). A:I-87.

Varanasi (= Benares) District; *Uttar Pradesh*, INDIA; 24°40′–25°30′N, 82°05′–83°30′E; captives obtained in 1891 by W. Heape (1897, p. 135). Not mapped (see A:I-87).

Vasunia, 3 km west of, Dangs District, 420 m; *Gujarat*, INDIA; 20°43′N, 73°38′E; observed 12 Jan. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 466). A:I-99.

Veer Sontri Forests, Kurukshetra District; *Haryana*, INDIA; 30°00′N, 77°01′E; observed Oct. 1989–Sept. 1990 by R. C. Gupta and S. Kumar (1992, p. 226). A:I-24.

Velatur, Guntur District, 5 m; *Andhra Pradesh*, INDIA; 16°08′N, 80°52′E; observed 10 May 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 468). A:I-142.

Velkicharla, Mahbubnagar District, 500 m; *Andhra Pradesh*, INDIA; 16°37′N, 78°07′E; observed 9 Apr. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 468). A:I-126.

Venketeswara Swami Temple, Aswaraopet Taluk, Khammam District; *Andhra Pradesh*, INDIA; ca. 17°15′N, 81°09′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 19). A:I-137.

Vergel. See Wargel.

Verigedu, Peravalli Block, East Godavari District; *Andhra Pradesh*, INDIA; not precisely located, 16°40′–17°50′N, 81°30′–82°35′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 19). Not mapped.

Viangchan; *Vientiane*. LAOS; ca. 17°58′N, 102°36′E; reported before 1964 by J. Deuve and M. Deuve (1963, p. 59). B:L-7.

[Victorial] Peak; *Xianggang* (= *Hong Kong*), CHINA; 22°16′N, 114°08′E; reported before 1952 by G. A. C. Herklots (1951, p. 83). C:C-210.

Vientiane. See Viangchan.

VIETNAM; 15°–23°N, 102°–109°E; collected 28 Feb. 1965 by unknown collector; ZMVNU, 2 (skulls only). Collected in 1992 and ?1994 by unknown collectors; IEBR, 2 (1 skin only, 1 skull only). Date and collector unknown; FCXM, 1 (skull only; identification tentative); IEBR, 14 (including 5 skins only, 8 skulls only); ZMVNU, 14 (3 skins only, 11 skulls only [one identification tentative]). Not mapped.

[VIETNAM]; 15°–23°N, 102°–109°E; collected before 1963 by J. Delacour and W. P. Lowe; MNHN, 2 (skulls only). Not mapped.

View, Simla vicinity; *Himachal Pradesh*, INDIA; ca. 31°06′N, 77°11′E; observed Aug. 1972–Feb. 1973 by K. Wada (1984, p. 477). A:I-18.

Vijayawada, Krishna District, 80 m; *Andhra Pradesh*, INDIA; 16°32′N, 80°38′E; observed 21 Nov. 1972 by N. Koyama and P. B. Shekar (1981, p. 248). A:I-144.

Vinh Linh region, 50 m; *Quang Tri*, VIETNAM; ca. 17°04′N, 107°02′E; collected 28 Aug. 1956 by unknown collector (Dao, 1960, p. 228; 1962, p. 724); misidentified as *M. assamensis*; museum unknown. C:V-32.

Vinukonda, Guntur District, 150 m; *Andhra Pradesh*, INDIA; 16°03′N, 79°45′E; observed 30 Apr. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 468). A:I-147.

Visakhapatnam. See Malkangiri.

Vizag. See Malkangiri.

Vrindavan (= Vrindaban); *Uttar Pradesh*, INDIA; 27°35′N, 77°42′E; observed 1964–1965 by C. H. Southwick and M. R. Siddiqi (1966, p. 309). Reported in 1996 by T. Patel (1996, p. 10). A:I-71.

Waddepalle, Banswada Taluk, Nizamabad District; *Andhra Pradesh*, INDIA; 18°14′N,

77°54′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18). A:I-117.

Walter Road. See Dhaka.

Wama, north of ; *Konarha*, AFGHANISTAN; ca. 35°20′N, 70°45′E; reported before 1972 by A. Puget (1971, p. 200). A:A-2.

Wangjuanshan, Huaiji Xian; *Guangdong*, CHINA ca. 24°15′N, 112°20′E; reported July 1982 by local residents (Liu Zhenhe, SCIEA, pers. comm., 25 Nov. 1985). C:C-200.

Wanglang Natural Reserve; *Sichuan*, CHINA; ca. 30°40′N, 103°20′E; reported 1968–1969 by Giant Panda Expedition of the Wanglang Natural Reserve (1974, p. 163). C:C-28.

Wangmo; *Guizhou*, CHINA; 25°14′N, 105°59′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-158

Wanhsien. See Wa Shan.

Wanxian; *Sichuan*, CHINA; 30°49′N, 108°21′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-38.

Wanyuan; *Sichuan*, CHINA; 32°04′N, 108°02′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-37.

Warangal, 350 m; *Andhra Pradesh*, INDIA; 18°00′N, 79°35′E; observed 18–19 Apr. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 467). A:I-121.

Wargel, Gajwel Taluk, Medak District; *Andhra Pradesh*, INDIA; 17°46′N, 78°38′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, p. 18). A:I-123.

Wa Shan (= Waschan), near Dong He (= Tungho), 900–2000 m; *Sichuan*, CHINA; ca. 29°15′N, 103°03′E; collected 29 Mar. 1915 by H. Weigold (1916, p. 74; 1922, p. iv; 1924, p. 71; 1935, p. 212; Israel, 1919, pl. 7; Jacobi, 1923, p. 1); RMNH, 2. C:C-140

Wassuland; *Sichuan*, CHINA; ca. 31°05′N, 103°10′E; tentatively reported 1914–1916 by H. Weigold (1924, p. 71). C:C-27.

Wazipur (= Uzipur); *Barisal*, BANGLADESH; 22°50′N, 90°15′E; reported before 1986 by M. A. R. Khan (1981, p. 13; 1985, p. 31). Observed Feb. 1990–June 1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, p. 76). B:Ba-24.

Weixi; *Yunnan*, CHINA; 27°13′N, 99°16′E; reported before 1998 (Zhang et al., 1997, p. 58). B:C-41.

Wenchang Xian; Hainan Dao; *Hainan*, CHINA; ca. 19°37′N, 110°43′E; reported before 1986 by Xu Longhui and Liu Zhenhe (1985, p. 148). C:C-231.

Wenchuan; *Sichuan*, CHINA; 31°28′N, 103°35′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-26.

Weng'an; *Guizhou*, CHINA; 27°00′N, 107°32′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-126.

West Bengal, INDIA; ca. 22°–28°N, 86°–90°E; obtained before 1857 by Theobald Collection; BM(NH), 1 (skull only). Collected date unknown by [C. A. Crump]; BNHS, 1 (skull only). Not mapped.

West Bhanugach; *Moulvi Bazar*, BANGLADESH; ca. 24°21′N, 91°48′E; reported early in 1980 by S. P. Gittins and A. W. Akonda (1982, p. 278). Observed Feb. 1990–June 1993 by M. M. Feeroz, M. A. Islam, and M. Kabir (1995, p. 76). B:Ba-13.

West District, east-central; *Tripura*, INDIA; ca. 23°55′N, 91°45′E; observed in 1976 and 1978 by R. P. Mukherjee (1982, p. 71). Observed May–Aug. 1989 by A. K. Gupta (1994, p. 102). B:I-40.

West District, south-central; *Tripura*, INDIA; ca. 23°37′N, 91°23′E; observed in 1976 and 1978 by R. P. Mukherjee (1982, p. 71). Observed May–Aug. 1989 by A. K. Gupta (1994, p. 102). B:I-40.

West District, southern; *Tripura*, INDIA ca. 23°05′N, 91°23′E; observed May–Aug. 1989 by A. K. Gupta (1994, p. 102). B:I-40.

West District, southwestern; *Tripura*, INDIA; ca. 23°17′N, 91°22′E; observed in 1976 and 1978 by R. P. Mukherjee (1982, p. 71). Observed May–Aug. 1989 by A. K. Gupta (1994, p. 102). B:I-40.

West District, western; *Tripura*, INDIA; ca. 23°43′N, 91°11′E; observed in 1976 and 1978 by R. P. Mukherjee (1982, p. 71). Observed May–Aug. 1989 by A. K. Gupta (1994, p. 102). B:I-40.

Wast Garo Hills District; *Meghalaya*, INDIA; ca. 25°30′N, 90°00′E; reported July 1985–Mar. 1987 by J. R. B. Alfred and J. P. Sati (1990, p. 300). B:I-11.

West Sichuan. See *Sichuan*, western.

West Timli; *Uttar Pradesh*, INDIA; ca. 30°23′N, 77°43′E; reported 1964–1966 by D. G. Lindburg (1977a, p. 268). A:I-26.

Wira, 1 km south of, Khammam District, 100 m; *Andhra Pradesh*, INDIA; 17°11′N, 80°22′E; observed 21 Apr. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 467). A:I-132.

Wolongshi. See Olongche.

Wonglung kun. See Luofu Shan.

Wuchi. See Wuzhi Shan.

Wudu; *Gansu*, CHINA; 33°24′N, 104°50′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-21.

Wuliang Shan Reserve; *Yunnan*, CHINA; ca. 24°00′N, 101°00′E; reported in 1990 by L. K. Sheeran and F. E. Poirier (1994, p. 21). B:C-73.

Wushan; *Sichuan*, CHINA; 31°02′N, 109°56′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-40.

Wu-tsao. See Xi Jiang.

Wuyi Shan; *Fujian*, CHINA; ca. 27°45′N, 117°39′E; reported 1963–1990 by Wu Haohan (1995, p. 277). Reported Nov. 1983 by Zheng Xueqing (1984, p. 145). C:C-76.

Wuzhi Shan, Hainan Dao; *Hainan*, CHINA; ca. 18°54′N, 109°40′E; collected 1–30 Oct. 1905 by A. Owston;AMNH, 10 (including holotype of *Pithecus brachyurus* and *Pithecus brevicaudus*); BM(NH), 1. C:C-232.

Wuzhou; *Guangxi*, CHINA; 23°29′N, 111°19′E; tissue sample obtained ca. 1991 by Zhang Yaping and Shi Liming (1993b, p. 589). C:C-197.

Xaignabouri, LAOS; ca. 19°15′N, 101°45′E; reported before 1964 by J. Deuve and M. Deuve (1963, p. 59). B:L-4.

Xhin Xhan. See Huangliangping.

Xialei Water Regulation Forest Reserve; *Guangxi*, CHINA; ca. 22°26′N, 106°26′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 129; letter, Aug. 1996). C:C-224.

Xianan, Huanjiang Xian; *Guangxi*, CHINA; ca. 24°59′N, 107°59′E; collected Oct. 1992 by local farmer (Wei Yuhei, manager of medical products station, pers. comm., 3 Nov. 1992); skeleton examined 3 Nov. 1992 at Huanjiang. C:C-177.

Xianan-Mulun, Huanjiang Xian; *Guangxi*, CHINA; ca. 25°03′N, 107°57′E; collected ca. 1991 by local resident (Tan Yulung, pers. comm., 5 Nov. 1992); skull examined 5 Nov. 1992 at Mulun. C:C-177.

Xiangcheng; *Sichuan*; CHINA; 29°00′N, 99°46′E, reported before 1998 (Zhang et al., 1997, p. 58). B:C-37.

Xianggang (= *Hong Kong*), CHINA; 22°10′–22°35′N, 113°55′–114°25′E; reported 1990–1992 by N. J. Goodyer (1992, p. 72); population apparently artificially introduced. Not mapped (see C:C-210).

Xiangkhoang, LAOS; ca. 19°20′N, 103°22′E; reported before 1964 by J. Deuve and M. Deuve (1963, p. 59). C:L-1.

Xidaming Shan Water Regulation Forest Reserve; *Guangxi*, CHINA ca. 2°49′N, 107°32′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 127; letter, Aug. 1996). C:C-225.

Xieng-Khouang. See *Xiangkhoang*.

Xi Golog (= Singolo); *Sichuan*, CHINA; 30°00′N, 100°42′E; collected 31 Oct. 1931 by Dolan West China Expedition (Schäfer, 1933, p. 191; 1942, p. 257; Stone, 1933, p. 170; Dolan, 1939, p. 178); ANSP (skin) / MCZ (skull), 1. B:C-30.

Xi Jiang (= Hsi-kiang; river), near Wuzhou (= Wu-tsao); *Guangxi*, CHINA; ca. 23°29′N, 111°19′E; collected 27 Apr. 1912 by R. Mell (Matschie, 1912, p. 305); ZMB, 1. C:C-197.

Xilin Shan Water Regulation Forest Reserve; *Guangxi*, CHINA; ca. 24°50′N, 110°10′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 129; letter, Aug. 1996). C:C-194.

Xindeng, Fuyang Xian, <500 m; *Zhejiang*, CHINA; 29°58′N, 119°44′E; collected 2 Feb. 1963 by museum collector; ZMNH, 1 (skin with skull inside). C:C-58.

Xinglong Xian, southern (= Eastern Tombs); *Hebei*, CHINA; ca. 40°24′N, 117°30′E; collected in 1867 by M. Fontanier (Milne-Edwards, [1870], pl. 32; [1872], p. 227; Zhang et al., 1989, p. 376); MNHN, 1 (holotype of *Macacus Tcheliensis*). Reported May–Oct. 1872 by A. David (1875, vol. 1 p. 42). Captive obtained 1879–1880 by S. W. Bushell (in Sclater, 1881, p. 537; Hill, 1974, pp. 581, 582); died in zoo 6 Mar. 1881; BM(NH), 1 (skin only). Reported in 1914 by local residents (Sowerby, 1925, p. 12). Collected and/or purchased 1920–1922 by R. C. Andrews, Third Asiatic Expedition (Andrews, 1932, p. 20; Pope, 1932a, p. 470); AMNH, 7; FMNH, 3. Collected in [1923] by F. R. Wulsin (letter, 9 Jan. 1925, USNM archives); USNM, 3 (including 1 skull only). Reported before 1940 by A. de C. Sowerby (1939, p. 228; 1941, p. 261). Observed in 1963 by Quan Guoqiang (Zhang et al., 1989, p. 379). Reported ca. 1964 by Shui Chingwong, Lee Yangwan, and Kan Singwun (Shou, 1964, p. 61). Reported in 1976 by local farmers to Quan Guoqiang (Zhang et al., 1989, p. 379). C:C-1.

Xinglung. See Xinglong Xian, southern.

Xingning; *Guangdong*, CHINA; 24°08′N, 115°43′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-95.

Xingyi; *Guizhou*, CHINA; 25°03′N, 104°59′E; re-

ported before 1998 (Zhang et al., 1997, p. 58). C:C-156.

Xinlong, Wanning Xian, 500–600 m; Hainan Dao; *Hainan*, CHINA; 18°45′N, 110°12′E; collected 3 July 1960 by Wu Luping (Liu Zhenhe, SCIEA, pers. comm., 26 Nov. 1985); SCIEA, 1. C: C-240.

Xinluwan, Suichang Xian; *Zhejiang*, CHINA; 28°42′N, 119°15′E; captives acquired 1970–1980 by Fu Yiyuan and Wu Fuhai, Hangzhou Zoo (pers. comm., 25 Oct. 1985). C:C-65.

Xinning Xian, southern; Hunan CHINA; ca. 26°20′N, 110°50′E; reported Nov. 1980 by local residents (Liu Zhenhe, SCIEA, pers. comm., 25 Nov. 1985). C:C-187.

Xinxiang (= Xinyang) Xian; *Henan*, CHINA; 35°19′N, 113°52′E; reported before 1989 by Tan Bangjie and F. E. Poirier ([1991], p. 131). C:C-9.

Xi Shia, Dongfang Xian, Hainan Dao; *Hainan*, CHINA; ca. 19°00′N, 108°55′E; collected 13 and 14 Apr. 1960 by Quan Guoqiang (pers. comm., 25 Aug. 1983); IZCAS, 3 (including 2 skulls only). C:C-235.

Xishuangbanna (perfecture); *Yunnan*, CHINA; 21°–23°′N, 99°–102°′E; collected in 1960 and 1964 by unknown collectors; KIZ, 2 (skins only). Not mapped (see B:C-80 through B:C-86).

Xishui; *Guizhou*, CHINA; 28°24′N, 106°15′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-134.

Xiuwu Xian; *Henan*, CHINA; 35°14′N, 113°26′E; reported before 1989 by Tan Bangjie and F. E. Poirier ([1991], p. 131). C:C-10.

Xuan Ninh; *Quang Binh*, VIETNAM; 17°20′N, 106°39′E; collected 17 Oct. 1964 by unknown collector (Dao, 1985, pp. 248, 225; external measurements published); IEBR, 1 (skin only). C:V-31.

Xunle vicinity, Huanjiang Xian; *Guangxi*, CHINA; ca. 25°22′N, 108°15′E; purchased Aug.–Oct. 1992 from local residents by Wu Xiaowu, Xunle (pers. comm., 4 Nov. 1992); three skins examined 4 Nov. 1992 at Xunle. C:C-176.

Xunle Water Regulation Forest Reserve; *Guangxi*, CHINA; ca. 25°22′N, 108°12′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 128; letter, Aug. 1996). C:C-176.

Yadagiri Gutta, Nalgonda District, 530 m; *Andhra Pradesh*, INDIA; 17°32′N, 78°55′E; observed 18 Apr. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 467). A:I-125.

Yadong Xian; *Xizang* (= *Tibet*), CHINA; ca. 27°30′N, 89°00′E; reported before 1964 by Shen Xiaozhou (1963, p. 140; Zhang et al., 1989, p. 379; 1991, p. 177; Zhang Yongzu, letter, 3 July 1996). B;C-1.

Yai-cheng. See Nychow.

Yajiang, 10000 ft (= 3050 m); *Sichuan*, CHINA; 30°02′N, 101°02′E; collected 26 Aug. 1908 by W. R. Zappey (Henshaw, 1912, p. 109; Dolan, 1939, p. 177); MCZ, 1. B; C-29.

Yangcheng; *Shanxi*, CHINA; 35°32′N, 112°36′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-5.

Yangliupu (= Yangliu), Xuancheng Xian, 200–400 m; *Anhui*, CHINA; ca. 30°50′N, 118°36′E; observed 1973–1986 by Xiong Chenpei (Wada et al., 1986, p. 83). C:C-54.

Yangshan; *Guangdong*, CHINA; 24°29′N, 112°38′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-202.

Yangtze Gorges. See Yichang (= Ichang).

Yanjing vicinity; *Xizang* (= *Tibet*), CHINA; ca. 29°07′N, 98°33′E; reported 1914–1916 by H. Weigold (1924, p. 71). B:C-35.

Yanyuan; *Sichuan*, CHINA; 27°25′N, 101°33′E; reported before 1998 (Zhang et al., 1997, p. 58). B:C-40.

Yao, Nam. See Mansam Falls.

Yellandu, Khammam District, 200 m; *Andhra Pradesh*, INDIA; 17°35′N, 80°20′E; observed 20 Apr. 1980 by J. Fooden, A. Mahabal, and S. S. Saha (1981, p. 467). A:I-134.

Yenangyaung. See Irrawaddy River.

Yen Bai, VIETNAM; 21°15′–22°20′N, 103°55′–105°10′E; collected in 1963 by unknown collector; IEBR, 1 (skin only). Not mapped.

Yeppuru, Nazvid Taluk, Krishna District; *Andhra Pradesh*, INDIA; ca. 16°45′N, 80°50′E; reported Feb. 1977–July 1980 by G. U. Kurup (1984, p. 58; 1992, pp. 17, 19). A:I-140.

Yiajia, Bawangling District, Changjiang Xian, 1000 m; Hainan Dao; *Hainan*, CHINA; 19°05′N, 109°08′E; collected 24 Oct. 1964 by Liu Zhenhe, SCIEA (pers. comm., 26 Nov. 1985); SCIEA, 1. C:C-234.

Yibin (= Suifu); *Sichuan*, CHINA; 28°46′N, 104°34′E; collected 10 Oct. 1922 by D. G. Graham; USNM, 1. C:C-137.

Yichang; *Hubei*, CHINA ca. 30°42′N, 111°18′E; reported before 1989 by Hu Hongxing (Zhang et al., 1989, p. 379; 1991, p. 177; Zhang Yongzu, letter, 3 July 1996). C:C-46.

Yichang (= Ichang), Chang Jiang (= Yangtze) gorges above; *Hubei*, CHINA; ca. 30°45′N,

111°15′E; reported before 1942 by A. de C. Sowerby (1941, p. 262). C:C-46.

Yicheng; *Shanxi*, CHINA; 35°42′N, 111°40′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-2.

Yigong, Bomi Xian 2250 m; *Xizang* (= *Tibet*), CHINA; 30°08′N, 95°02′E; collected 24 June 1973 by Zheng Changlin and Cai Guiquan (pers. comm., 7 Oct. 1985; Feng et al., 1984, p. 344); NWPIB, 1. B:C-11.

Yigong Forest Reserve, Bomi Xian; *Xizang* (= *Tibet*), CHINA; 30°08′N, 95°02′E; captives obtained 1979–1982 by Zhang Cizu, Director, Shanghai Zoo (pers. comm., 18 Oct. 1985); captives observed 18 Oct. 1985. B:C-11.

Yiliang; *Yunnan*, CHINA; 27°35′N, 104°01′E; tissue sample obtained ca. 1991 by Zhang Yaping and Shi Liming (1993b, p. 589). C:C-143.

Yin, east bank of lower Chindwin River; *Sagaing*, MYANMAR (= BURMA); 22°47′N, 94°42′E; collected 9–18 June 1914 by G. C. Shortridge (in Wroughton, 1916a, p. 294); BM(NH), 1; BNHS, 1; FMNH, 2; ZSI, 1 (skin only). B:M-24.

Yin, lower Chindwin River; *Sagaing*, MYANMAR (= BURMA); 22°47′N, 94°42′E; collected 15 and 18 June 1914 by G. C. Shortridge and S. A. Macmillan (Shortridge in Wroughton, 1916a, p. 294); BNHS, 3. B:M-24.

Yindian Shan Water Regulation Forest Reserve; *Guangxi*, CHINA; ca. 25°26′N, 110°30′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 128; letter, Aug. 1996). C:C-190.

Yingde; *Guangdong*, CHINA; 24°10′N, 113°24′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-204.

Yingjiang; *Yunnan*, CHINA; 24°48′N, 98°05′E; reported before 1998 (Zhang et al., 1997, p. 58). B:C-60.

Yinjiang; *Guizhou*, CHINA; 28°01′N, 108°24′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-118.

Yixian (= Qianxian); *Anhui*, CHINA; 29°53′N, 117°57′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-62.

Yong'an Xian; *Fujian*, CHINA; ca. 25°58′N 117°22′E; reported Apr. 1981 by Zheng Xueqing (1984, p. 145). C:C-89.

Yongchun; *Fujian*, CHINA; 25°19′N, 118°17′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-87.

Yongde vicinity; *Yunnan*, CHINA; ca. 24°00′N, 99°15′E; purchased in market Aug. 1964 by Quan Guoqiang (pers. comm., 25 Aug. 1983); IZCAS, 1 (skin only). B:C-66.

Yongshan; *Yunnan*, CHINA; 28°11′N, 103°35′E; tissue sample obtained ca. 1991 by Zhang Yaping and Shi Liming (1993b, p. 589). C:C-142.

Yongsheng [Xian]; *Yunnan*, CHINA; ca. 26°42′N, 100°45′E; blood sample obtained before 1999 by Ding Bo, Zhang Yaping, and Hou Yidi (1998, p. 172). B:C-46.

Yongshun; *Hunan*, CHINA; 29°00′N, 109°54′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-112.

Yongtai Xian; *Fujian*, CHINA; ca. 25°52′N, 118°55′E; reported Nov. 1983 by Zheng Xueqing (1984, p. 146). C:C-84.

Yongyap Chu (= Yongyap Valley), 9500 ft (= 2900 m); *Arunachal Pradesh*, INDIA; ca. 29°10′N, 95°37′E; observed May–June 1913 by F. M. Bailey (1914, map; 1915, p. 74). B:I-27.

Youxi Xian; *Fujian*, CHINA; ca. 26°10′N, 118°11′E; reported Mar. 1981 by Zheng Xueqing (1984, p. 145). C:C-83.

Youyang; *Sichuan*, CHINA; 28°52′N, 108°45′E; reported before 1992 by Jiang Xuelong, Wang Yingxiang, and Ma Shilai (1991, p. 244). C:C-117.

Yu, Nam. See Ou, Nam.

Yuanbao Shan Nature Reserve; *Guangxi*, CHINA; ca. 25°27′N, 109°10′E; observed 1976, 1986, and 1993 by Liu Wanfu and Wei Zhenyi (1995, p. 126; letter, Aug. 1996). C:C-182.

Yuanmou; *Yunnan*, CHINA; 25°42′N, 101°52′E; reported before 1998 (Zhang et al., 1997, p. 58). B:C-49.

Yuanqu; *Shanxi*, CHINA; 35°18′N, 111°41′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-14.

Yuhun, Lingyun Xian; *Guangxi*, CHINA; ca. 24°24′N, 106°31′E; collected 10 Aug. 1978 by Neuong Shihua; FDCG, 1 (skull only). Collected Nov.–Dec. 1978 by Ling Chen; FDCG, 1 (skull only). C:C-171.

Yung-ling. See Xinglong Xian, southern.

Yunlong [Xian]; *Yunnan*, CHINA; ca. 25°50′N, 99°28′E; blood sample obtained before 1999 by Ding Bo, Zhang Yaping, and Hou Yidi (1998, p. 172). B:C-55.

Yunnan, CHINA; 21°–29°N, 98°–106°E; collected in 1957 by Quan Guoqiang; IZCAS, 1 (skull only). Date and collector unknown; IZCAS, 1 (skull only). Not mapped.

Yunnan, [northwestern], CHINA; 25°–29°N, 97°–102°E; tissue samples obtained ca. 1991 by

Zhang Yaping and Shi Liming (1993b, p. 589, fig. 1). Not mapped (see B:C-36).

Yunnan border; *Sichuan*, CHINA; ca. 28°20′N, 104°20′E; collected 17 Sept. 1928 by D. G. Graham; USNM, (skull only). C:C-138.

Yunnan border, south of Yibin (= Suifu) 3000 ft (= 910 m); *Sichuan*, CHINA; ca. 28°20′N, 104°20′E; collected 19 Feb. and 25 Mar. 1932 by D. G. Graham; USNM, 2. C:C-138.

Yuqing; *Guizhou*, CHINA; 27°12′N, 107°56′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-120.

Yushu Xian, 3600–4300 m; *Qinghai*, CHINA; ca. 33°00′N, 96°45′E; reported 1959–1961 by Chang Chieh and Wang Tsung-yi (1963, p. 126). Captive obtained in 1981 by Liao Yianfa, Director, Xining Zoo (pers. comm., 6 Oct. 1985); captive observed 6 Oct. 1985. B:C-17.

Zackala. See Yanjing vicinity.

Zayü Xian; *Xizang* (= *Tibet*), CHINA; ca. 28°28′N, 97°04′E; collected in 1973 by Feng Zuojian (Feng et al., 1984, p. 344; Quan Guoqiang, letter, 30 Oct. 1995); IZCAS, 3 (including 1 skin only). Purchased Aug. 1973 at traditional medicine shop, Qamdo, by Zheng Changlin (pers. comm., 7 Oct. 1985); NWPIB, 3 (skulls only). B:C-34.

Zhangjiajie Nature Preserve. See Suoxi Valley.

Zhaotan (= Zhaotang), Dongzhi Xian, 200–500 m; *Anhui*, CHINA; ca. 29°39′N, 116°49′E; observed 1973–1986 by Xiong Chenpei (Wada et al., 1986, p. 83). C:C-47.

Zhayun, Qiongzhong Xian, Hainan Dao, 200 m; *Hainan*, CHINA; 19°00′N, 109°36′E; collected 15 Oct. 1963 by Liu Zhenhe, SCIEA (pers. comm., 26 Nov. 1985); SCIEA, 1. C:C-232.

Zheng'an; *Guizhou*, CHINA; 28°30′N, 107°30′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-132.

Zhengba Xian; *Shaanxi*, CHINA; ca. 32°30′N, 107°50′E; captives obtained Aug. 1985 by Tian Xiaoming, Director, Xi'an Zoo (pers. comm., 11 Oct. 1985); captives observed 11 Oct. 1985. C:C-36.

Zhenping; *Shaanxi*, CHINA; 31°56′N, 109°31′E; reported 1963–1966 by Wu Jiayan and Li Guihui (1982, p. 63). C:C-41.

Zhenyuan Xian; *Yunnan*, CHINA; ca. 23°51′N, 100°59′E; immunological survey conducted before 1996 by Duan Xingsheng, Liu Yuanwei, Wu Jing, Dao Weiying, and Liu Jianghai (1995, p. 411). B:C-73.

Zhidaikou, Suichang Xian; *Zhejiang*, CHINA; 28°16′N, 118°46′E; observed Aug. 1985 by Kang Ximin, ZMNH (pers. comm., 24 Oct. 1985). C:C-66.

Zhongdian; *Yunnan*, CHINA; 27°50′N, 99°36′E; reported before 1992 by Jiang Xuelong, Wang Yingxiang, and Ma Shilai (1991, p. 243). B:C-38.

Zhongtiao Shan, 1050–1500 m; Shanxi CHINA; ca. 35°15′N, 111°30′E; reported before 1966 by Tang Changzhu, Ma Yong, Wang Jianjun, Wang Ziyu, and Zhou Naiwu (1965, p. 88). Reported before 1987 by Wang Sung and Quan Guoqiang (1986, p. 215), C:C-14.

Zhongzhou; *Guangxi*, CHINA; ca. 22°40′N, 107°05′E; collected 24 Mar. 1982 by Wu Mingchuan (pers. comm., 27 Nov. 1992); FDCG, 1 (skin with skull inside). C:C-223.

Zhoucun, Jiangshan Xian, 1000 m; *Zhejiang*, CHINA; 28°22′N, 118°37′E; collected Jan. 1985 by Kang Ximin (pers. comm., 24 Oct. 1985); ZMNH, 1 (skull examined, skin unavailable Oct. 1985). Collected 13 May 1985 by Kang Ximin (pers. comm., 24 Oct. 1985); museum unknown. C:C-66.

Zhouning Xian; *Fujian*, CHINA; ca. 27°15′N, 119°13′E; reported Oct. 1980 by Zheng Xueqing (1984, p. 146). C:C-69.

Zhuhai Xian. See Dangan Dao.

Zhushan; *Hubei*, CHINA; 32°13′N, 110°24′E; tissue sample obtained ca. 1991 by Zhang Yaping and Shi Liming (1993b, p. 589). C:C-42.

Zhuxi, Longquan Xian; *Zhejiang*, CHINA; 28°11′N, 118°54′E; purchased Sept. 1972 from local residents by Cai Chunmo, ZMNH (pers. comm., 24 Oct. 1985); not retained. C:C-66.

Zigui; *Hubei*, CHINA; 31°01′N, 110°35′E; reported before 1998 (Zhang et al., 1997, p. 58). C:C-45.

Zixi Xian; *Jiangxi*, CHINA; ca. 27°45′N, 117°00′E; trapped in 1982 for Nanchang Zoo (Huang Zhangsen, pers. comm., 28 Oct. 1985); captives observed 28 Oct. 1985. C:C-78.

Zoigê Xian; *Sichuan*, CHINA; ca. 33°30′N, 102°54′E; reported before 1983 by Hu Jinchu and Wang Youzhi (Zhang et al., 1989, p. 379; 1991, p. 177; 1997, p. 58; Zhang Yongzu, letter, 3 July 1996). B:C-25.

Zunyi vicinity; *Guizhou*, CHINA; ca. 27°42′N, 106°55′E; purchased in market Nov. 1960 by Quan Guoqiang (pers. comm., 25 Aug. 1983); IZCAS, 1 (skin only). Collected 30 and 31 May 1964 by Fang Lixiang; BMNH, 4 (skins only). C:C-129.

Index

Specific and subspecific names referable to *Macaca mulatta* are spelled here as they were originally proposed.

abbreviations, institutional names 1
Allen's rule 87
annual mortality rate 78
Anopheles 53
arboreality 54
archaeological evidence 3, 89, 154
Axis axis 68

Bergmann's rule 28
beta-globin gene 52
birth peaks 68
birth rate, annual 75
birth weight 75
blood proteins 52, 83
body weight
  adult 30
  neonatal 75
brachyurus 86
brevicaudus 24, 86

Canis aureus 68
cerebrospinal fluid 53
chemokine receptor 52
chromosomes 52
climatic deterioration 87
commensalism with humans 54
competition, interspecific 3
consortship 72
copulatory behavior 72
Corvus sp. 68
cranial measurements 38
  geographic variation 39, 79
  insular variation 39
  ontogeny 38
  sexual dimorphism 38
crop raiding 54, 57

day range 57
death, causes of 78
dental emergence 38
diet 57
  geographic variation 57
  ingestion of soil 59
  nutritional requirements 59
  seasonal variation 57
diploid chromosome number 52
dispersal scenario 87
distribution
  factors limiting 3
  geographic 2
dominance rank and reproductive success 73
drinking 60

elevational range 54
erythraea 84
estrous cycle 71
evolutionary hypothesis 87
external measurements 26
  geographic variation
    body weight 30
    head and body length 26, 79
    relative tail length 29, 81, 87
    tail length 29, 81
  hybrids 26
  ontogeny 26
  sexual dimorphism 26
extirpated population 3

fascicularis group 87
fat deposits, seasonal variation 71
feeding schedule 61
fossils 79
founder effect 89
fulvus 84

geophagy 59
geographic reference works 124
gestation length 74
glacial maximum, last 87
glans, color of 7
golden pelage phenotype 7
group fission 57
group size and composition 56

habitats 54
harassment of copulations 73
hematology 53
home range
  area 57
  seasonal variation 57
homosexual mounting 74
HPRT locus 52
hybridization 29, 30, 89
hybrids 26, 53

inbreeding, incidence of 73
inerspecific behavior 66
  intergeneric 68
  intrageneric 66
infant
  corpse carried by mother 76
  mortality rate 75
  sex ratio 75
infanticide 78
infrazygomatic crest 7
insular populations 3, 79, 81, 89
intergroup behavior 62
intergroup transfer 63, 70
introduced populations 3, 67
invertebrate prey 59

karyology 52

lasiotis 22, 26, 85
last glacial maximum 87
lateral facial crest 7
lead content of molars 53
Leucosphyrus group 53
littoralis 23, 85
longevity 78

Macaca
  arctoides 66
  assamensis 16, 66
  cyclopis 87
  fascicularis 3, 44, 67, 87, 89
  fuscata 16, 87, 89
  nemestrina 66
  radiata 3, 16, 67
  thibetana 16, 66
malaria 53
Marmota himalayana 3
masturbation 74
mcmahoni 18, 86
menarche 70
menopause 77
menstrual cycle 71
mitochondrial DNA 44, 82, 89
molecular biology 44
molting 11
mortality rate, annual 78
multimount ejaculation 72
Muntiacus muntjak 68
museums 1

natural history 54
neutral mutation hypothesis 52
nipalensis 84
nonreproductive sexual behavior 74
nuclear DNA 52, 83
nursing 76
nutritional requirements 59

oinops 84

parturition 56, 74
pelage 7
  elevational variation 7
  erythrism 7
  geographic variation 15, 16, 82
  hair banding 7
  hair length 26, 82
  hairiness of ears 26
  individual variation 21, 25, 82
  neonatal 7
  Nepalese standards 16
  ontogenetic changes 7
  seasonal variation 11
  survey of sample areas 16
Plasmodium 54
population
  density 57
  estimates 7
  growth rate 78
predators 61, 78
pregnancy 74

prey 59
provisioned groups 57, 65, 74

rejected locality records 3, 129, 155
relative tail length 29, 81, 87
reproduction 68
reproductive success 73
rhesus 84

sagittal crest 44
sancti-johannis 24, 84
scream call 54
seasonal breeding 68
Semnopithecus entellus 68
serotonin activity 66
sex ratio
  adult 57
  neonatal 75
sexual maturation 70
sexual skin 7, 71
  females 71
  males 71
shoulder girdle and humerus 56
siamica 25, 86
simian immunodeficiency virus 54
simian T-lymphotropic retrovirus 54
simple sequence repeat loci 52
sinica group 89
sleeping sites 56
snakes, fear of 62
solitary males 57
southern hemisphere, reversed cycles 69
specimens examined 121
stillbirths, frequency of 74
subfossils 79
subspecific recognition 79
swimming 56
synonymy 83
systematics 79

tail carriage 29
tcheliensis 23, 85
temperament 53
terrestriality 54
testicular descent 70
time budget 66
Trachypithecus
  geei 68
  pileatus 68
transzygomatic crest 7
twinning, frequency of 74
type 86
type locality 86

vaginal plug 73
vectors, malaria infection 53
vegetational range 54
vertebrate prey 59
vestitus 22, 85
villosus 17, 85
viral infections 54

water requirements 59
weaning 76
weight. *See* body weight

A Selected Listing of Other *Fieldiana: Zoology* Titles Available

Studies in Neotropical Mammalogy: Essays in Honor of Philip Hershkovitz. Edited by Bruce D. Patterson and Robert M. Timm. *Fieldiana: Zoology*, n.s., no. 39, 1987. 506 pages.

Publication 1382, $45.00

Systematic Review of Philippine Macaques (Primates, Cercopithecidae: *Macaca fascicularis* subspp.). By Jack Fooden. *Fieldiana: Zoology*, n.s., no. 64, 1991. 44 pages, 11 illus., 11 tables.

Publication 1426, $15.00

A Key to the Bats of the Philippine Islands. By Nina R. Ingle and Lawrence R. Heaney. *Fieldiana: Zoology*, n.s., no. 69, 1992. 44 pages, 60 illus., 5 tables.

Publication 1440, $14.00

Systematic Review of Southeast Asian Longtail Macaques, *Macaca fascicularis* (Raffles, [1821]). By Jack Fooden. *Fieldiana: Zoology*, n.s., no. 81, 1995. 206 pages, 31 illus., 39 tables.

Publication 1470, $65.00

The Birds of Sibuyan Island, Romblon Province, Philippines, with Particular Reference to Elevational Distribution and Biogeographic Affinities. By Stephen M. Goodman, David F. Willard, and Pedro C. Gonzales. *Fieldiana: Zoology*, n.s., no. 82, 1995. 57 pages, 12 illus., 7 tables.

Publication 1471, $12.00

Frogs of Vietnam: A Report on New Collections. By Robert F. Inger et al. *Fieldiana: Zoology*, n.s., no. 92, 1999. 46 pages, 18 illus., 11 tables.

Publication 1489, $20.00

Mammalian Diversity on Mount Isarog, a Threatened Center of Endemism on Southern Luzon Island, Philippines. By Lawrence R. Heaney et al. *Fieldiana: Zoology*, n.s., no. 95, 62 pages, 30 illus., 12 tables.

Publication 1504, $18.00

Order by publication number and ask for a free copy of our price list. All orders must be prepaid. Illinois residents add current destination tax. All foreign orders are payable in U.S. dollars: checks drawn on any U.S. bank or the U.S. subsidiary of any foreign bank. Prices and terms subject to change without notice. Address all requests to:

FIELD MUSEUM OF NATURAL HISTORY
Library—Publications Division
1400 South Lake Shore Drive
Chicago, Illinois 60605-2496 U.S.A.

Field Museum of Natural History
1400 South Lake Shore Drive
Chicago, Illinois 60605-2496
Telephone: (312) 665-7055