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The Chimpanzees of Bossou and Nimba

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Tetsuro Matsuzawa • Tatyana Humle
Yukimaru Sugiyama
Editors

The Chimpanzees of Bossou and Nimba

 Springer



Editors

Tetsuro Matsuzawa, Ph.D.
Professor
Director, Primate Research Institute
Kyoto University
41-2 Kanrin, Inuyama
Aichi 484-8506, Japan
matsuzaw@pri.kyoto-u.ac.jp

Yukimaru Sugiyama, Ph.D.
Professor Emeritus
Primate Research Institute
Kyoto University
41-2 Kanrin, Inuyama
Aichi 484-8506, Japan
hqvg62yd@qc.commufa.jp

Tatyana Humle, Ph.D.
School of Anthropology and Conservation
The Marlowe Building
University of Kent
Canterbury CT2 7NR, UK
t.humle@kent.ac.uk

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Cover

Front cover: From top, clockwise: An infant female chimpanzee (Joya) watching her mother (Jire) cracking nuts with a pair of stone tools (photo by Etsuko Nogami). Tree nursery for the green corridor project (photo by Tatyana Humle). World Natural Heritage site, the Nimba Mountains, a natural boundary between Guinea, Liberia and Côte d'Ivoire (photo by Kathelijne Koops). A group of chimpanzees at Bossou crossing a road in front of villagers (photo by Tetsuro Matsuzawa).

Spine: An infant male chimpanzee (Flanle) clinging to his mother. Notice that he has a sixth finger (photo by Kathelijne Koops).

Back cover: From top, clockwise: Jire's family in a tree: the mother, Jire (*right*), rests while her daughter, Joya (*middle*), and her older son, Jeje (*left*), play together (photo by Tatyana Humle). Jire and her daughter, Joya, eating leaves in a cultivated field (photo by Tatyana Humle). Fresh oil palm fruits and dried nuts placed in the outdoor laboratory for the observation of nut cracking (photo by Tetsuro Matsuzawa). Thunderstorm at night in Bossou (photo by Akihiro Hirata, Mainichi Newspapers).

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Foreword

From an evolutionary perspective, chimpanzees (*Pan troglodytes*) are our closest living relatives. Nearly 50 years of research on chimpanzees in their natural habitat has revealed many remarkable facets of their social and physical cognitive abilities and their capacity to survive in a range of habitat types. Wild chimpanzees primarily inhabit evergreen forest, but some populations also persist in deciduous woodland and grassland biotopes interspersed with gallery forest. Wild chimpanzees can be found today in 21 countries in Africa lying between 13°N and 7°S of the equator. Despite this wide distribution, our current understanding of their behavior comes from only six long-term field sites – Gombe and Mahale (Tanzania), Kibale and Budongo (Uganda), Taï (Côte d’Ivoire), and Bossou (Guinea) – and a few other newer sites including Nimba (Guinea/Côte d’Ivoire/Liberia), Fongoli (Senegal), Gashaka (Nigeria), Goulougo (Republic of Congo), Kalinzu and Semliki (Uganda), and Ugalla (Tanzania).

According to the International Union for the Conservation of Nature and Natural Resources Red List (IUCN 2009), chimpanzees in their natural habitat are in danger of extinction. Their populations have declined by more than 66% in the past 30 years, from around 600,000 to fewer than 200,000 individuals (Kormos et al. 2003). This tendency is all the more concerning as chimpanzees are extremely vulnerable to demographic decline and are unable to recover as rapidly as other species. Female chimpanzees indeed typically only give birth to a single offspring every 5–6 years. In addition, the majority of wild chimpanzees (e.g., more than 90% in Guinea, West Africa) (Kormos et al. 2003) live outside protected areas and are thus extremely vulnerable to human anthropic pressures.

In this regard, Bossou is an exceptional site because of its close proximity with human settlements and activities. This site harbors a single chimpanzee community that has cohabited alongside the local Manon people for many generations. Research at Bossou began in the 1960s with Adrian Kortlandt, a Dutch primatologist. More systematic research focused on this unique chimpanzee community began in 1976 with Prof. Sugiyama of Kyoto University, Japan. The research presence of Kyoto University in the region led to a convention for scientific cooperation between Guinea and Japan through the Direction Nationale de la Recherche Scientifique et Technologique (DNRST) and Kyoto University Primate Research Institute (KUPRI). This collaboration gave me the amazing opportunity to be granted a fellowship from the Japanese government in 1985. Under the supervision

of Prof. Sugiyama, I studied Japanese monkeys (*Macaca fuscata*) in Japan for 7 years and received an M.A. and a Ph.D. degree in primatology from KUPRI.

Ever since 1986, when Prof. Matsuzawa joined the Bossou field site, research and cooperation between Guinea and Japan have considerably gained in strength. The Institut de Recherche Environnementale de Bossou (IREB) was created, in 1995, as a symbol of collaboration between Guinea and Japan. The research facility of IREB as it stands today was completed in 2001. This facility greatly improved the in situ living conditions and research activities. The desire of Prof. Matsuzawa to bridge oriental and occidental primatology by bringing together students from different parts of the world ultimately led to the emergence of KUPRI-International. This initiative began in 1995. Dr. Tatyana Humle was the first non-Japanese student to pursue her Ph.D. research on chimpanzees at Bossou and surrounding areas. In the following years, students from countries as widespread as Portugal, Hungary, The Netherlands, the UK, the USA, Brazil, and France joined the team of researchers and students from Kyoto University. Together they have been implementing a detailed research program on chimpanzees at Bossou, the Nimba Mountains (6 km distant on the border with Liberia and Côte d'Ivoire), Diécké (50 km away), and surrounding areas, including some in Liberia, in collaboration with the DNRST and IREB and national authorities of neighboring countries. In parallel to this research program, this team in collaboration with IREB and local people has been promoting environmental education in the region and has developed a reforestation program known as the Green Corridor Project. This project, which was initiated by Prof. Matsuzawa in 1997, aims to connect the semi-isolated Bossou chimpanzee community with those chimpanzees inhabiting the Nimba Mountains region, a World Heritage Site characterized by its exceptional biodiversity and landscape.

In November 2006, an international symposium took place in Conakry in celebration of 30 years of research at Bossou. This meeting marked my renewed involvement in chimpanzee research and conservation at Bossou and the Nimba Mountains. In April 2009, I was appointed the new director of IREB. While pursuing research and conservation on chimpanzees in the region, in collaboration with KUPRI-International, our prime objective will be to prepare and train Guinean students to become the researchers and conservationists of tomorrow.

This book describes the achievements of the KUPRI international team, which has made significant contributions to our current understanding of behavior, ecology, sociology, culture, and cognition in chimpanzees, as well as that of conservation issues related to health, great ape-human conflicts, and traditional beliefs, and also local perceptions and practices. Although this book focuses on one region, on one great ape species and its habitat, the lessons learned and knowledge gained should serve to help promote conservation of all great apes living in their natural habitat. Aside from Ebola outbreaks, human activity constitutes today the greatest threat to the great apes. However, Bossou embodies ways that humans and wildlife can persist together in close proximity. Our goal in collaboration with the local people is to help preserve this harmony.

Aly Gaspard Soumah, Ph.D.

Director of the Institut de Recherche Environnementale de Bossou (IREB)

Preface

This book is about the wild chimpanzees of Bossou and Nimba, West Africa, as well as those of the surrounding areas. Bossou chimpanzees are renowned for their use of a pair of mobile stones as hammer and anvil to crack open oil-palm nuts. They use a set of folded broad leaves to drink water from tree hollows. They modify sticks to fish for algae floating on the surface of ponds. They manufacture pestles from palm fronds to pound the center of the palm crown to mash the palm heart. These examples of tool use and manufacture are unique to this chimpanzee community. Just like human communities, each chimpanzee community has its own set of cultural traditions. This book aims to illuminate the unique way of life of the wild chimpanzees dwelling in Bossou and its surrounding areas.

Bossou is the name of a village that is located in the southeastern corner of the Republic of Guinea. This village is situated about 1,000 km from the capital, Conakry. The last nationwide chimpanzee census in Guinea suggests that the country may be home to several thousand chimpanzees. However, to anyone travelling to Bossou by land, it quickly becomes clear that the natural habitat is highly disturbed by human activity such as logging, cultivation, cattle farming, and so forth. Bossou is a rare exception in the coexistence between humans and chimpanzees. Bossou chimpanzees can therefore easily be observed. The community comprised about 20 chimpanzees for more than four decades at least up until very recently.

The coexistence between humans and chimpanzees at Bossou is made possible by the local Manon people, who in the majority respect chimpanzees as their totem and consider them the reincarnation of their ancestors. The villagers have protected this community and parts of its core habitat for many generations. That is why Bossou chimpanzees continue to thrive alongside a human-dominated habitat that supports thousands of people. The habitat of Bossou chimpanzees is a mosaic of forest, savanna, and cultivated fields. It is isolated by savanna from the larger forests of the Nimba Mountains.

Bossou is located only about 10 km from the main ridge of the Nimba Mountains. Nimba is a UNESCO-designated world heritage site renowned for its rich fauna and flora and its unique biodiversity, which has attracted scientists ever since colonial times. Nimba is at the center of the Upper Guinean forest hotspot and a landmark in West Africa because it borders three countries: Guinea, Côte d'Ivoire, and Liberia. The chimpanzee population of the Nimba Mountains is estimated to be in the hundreds.

This book is the outcome of a collective effort of scholars who have endeavored to understand and conserve the chimpanzees of Bossou and Nimba. Yukimaru Sugiyama began his study of Bossou chimpanzees in 1976. He was later joined by Tetsuro Matsuzawa in 1986 and then followed by other Japanese researchers. Tatyana Humle joined as the first non-Japanese researcher in 1995 and was followed by an international team including Guinean scholars. According to our records as of March 2010, Yukimaru Sugiyama visited Bossou 22 times for a total of 57 months, Tetsuro Matsuzawa 21 times for 40 months, Gen Yamakoshi 13 times for 43 months, Gaku Ohashi 12 times for 42 months, Tatyana Humle 11 times for 43 months, and so forth. In that sense, this book is the product of 48 researchers from nine countries (Japan, Guinea, USA, UK, France, Hungary, Mexico, Brazil, and Portugal) who cumulatively visited Bossou 181 times for a total of 538 months. These 44.8 observation-years always involved the collaboration of local Manon field assistants. Without their dedication and help, we would have not been able to comprehensively appreciate the unique way of life of the wild chimpanzees of Bossou.

We celebrated the 30-year anniversary of the Bossou project in November 2006 in Conakry and then in Bossou. The idea of this book was born at this anniversary meeting, but much extra effort was needed to finally realize this endeavor. During the process, we lost a number of important Guinean collaborators: Mr. Gouanou Goumy, our first guide; Mr. Tino Zogbila, our second guide; Mrs. Nyonko Traore, our first cook; Mr. Soh Pleta Bonimy, an NGO collaborator; and Dr. Koulibaly Bakary, an administration officer. The book is dedicated to them, as a tribute to their lifetime commitment to promote the study and conservation of chimpanzees in Bossou and Nimba. Although they have passed away, the pleasant times and memories we have shared together still remain engraved in our hearts.

We have also lost beloved chimpanzees: Kai, Nina, Pru, Poni, Jokro, Veve, Jimato, and Jodoamon, among others. There was a flu-like epidemic among Bossou chimpanzees at the end of 2003 which led to the death of five chimpanzees—the most tragic event in the site's history. Since then, the number of chimpanzees at Bossou has not recovered. One of our conservation initiatives, the Green Corridor project, was initiated in 1997. This project aims to plant trees in the savanna to connect the isolated habitats of Bossou with the forest of the Nimba Mountains. This initiative is progressing well but will require further effort and investment before completion. In spite of our conservation efforts and initiatives, conflict between humans and chimpanzees has worsened in recent years. We think that this might be due to the negative impact of researchers' habituation of wild chimpanzees in conjunction with a steady increase in the size of the local human population. The population of Bossou was about 1,000 for a long time but it now probably exceeds 3,000. This increase concords with the influx of refugees fleeing civil war in neighboring countries, especially Liberia. This book provides us an opportunity to reflect, and to assess what we have done in our attempts to understand chimpanzees. We sincerely hope that the collaboration among all the people concerned about chimpanzees at Bossou and the surrounding areas continues to develop. Such cooperation among all stakeholders is crucial in continuing to identify and implement

realistic and practical solutions which will ensure an enduring peaceful coexistence between humans and chimpanzees, our closest evolutionary relatives.

In the final part of the preface, we would like to mention the people and the organizations who have contributed to the Bossou–Nimba project. This project has mainly been financed over the years by the Ministry of Science, Technology, Education, Culture and Sports of Japan (for example, MEXT 12002009, 16002001, 20002001 in recent years). We are also immensely grateful to the Japan Society for the Promotion of Science (JSPS) core-to-core program HOPE, the Ministry of the Environment (Japan), the U.S. Fish and Wildlife Services, Conservation International, the Houston Zoo (USA), the Matsushita International Foundation, the Leakey Foundation (USA), the Wenner–Gren Foundation, the Lucie Burgers Foundation (the Netherlands), the Schure–Beijerinck–Popping Foundation (the Netherlands), the International Primatological Society, the National Institutes of Health (USA), the IUCN/SSC Primate Specialist Group, the Royal Society (UK), the University of Cambridge (UK), and the University of Stirling (UK).

We also sincerely appreciate the collective efforts of many Guinean collaborators and counterparts. The Bossou–Nimba project is based on two conventions: one between KUPRI (Kyoto University Primate Research Institute) and DNRST (Direction Nationale de la Recherche Scientifique et Technologique), and another between KUPRI and IREB (Institut de Recherche Environnementale de Bossou). IREB is a unique institute for the promotion of environmental research, and is located on-site in Bossou. Since its establishment in situ in 2001, this institution has truly promoted the collaboration between Guinean and foreign researchers. We would also like to acknowledge and express our thanks for the collaboration of the Ivorian Government for granting us the permission to work in the Nimba Mountains in Yealé and Gouéla, on the Ivorian side of the massif, and the Government of Liberia for permission to conduct surveys around Yekepa.

The following people have all participated as core researchers in the Bossou–Nimba project: Yukimaru Sugiyama, Jérémy Koman, Aly Gaspard Soumah, Tetsuro Matsuzawa, Osamu Sakura, Takao Fushimi, Rikako Tonooka, Gen Yamakoshi, Hiroyuki Takemoto, Makoto Shimada, Tatyana Humle, Masako Myowa-Yamakoshi, Satoshi Hirata, Dora Biro, Naruki Morimura, Shiho Fujita, Gaku Ohashi, Claudia Sousa, Nicolas Granier, Misato Hayashi, Laura Martinez, Asami Kabasawa, Joël Gamys, Kathelijne Koops, Miho Ito, Shigeo Kobayashi, Kazunari Ushida, Kimberley Hockings, Ryo Hasegawa, Susana Carvalho, Makan Kourouma, and Michiko Fujisawa.

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We are also extremely grateful to the Japanese Embassy in Guinea, especially the current ambassador, Hiroshi Sumimoto, and his predecessors, as well as the French Embassy and the British Embassy in Guinea.

In closing, we would like to express our gratitude to our publisher, Springer Japan. We especially thank Ms. Aiko Hiraguchi for her editorial work. Without her continuous support and encouragement, this book would never have seen the light of day. Thanks are also due to all the editorial staff at Springer who participated in the publishing process. This book is the product of the collaboration of a large and diverse team of people. We really hope that this volume will provide stimulating reading to all those interested in chimpanzees, our closest evolutionary neighbors, by illuminating their past, present, and future.

Kyoto University, Japan
University of Kent, UK
Kyoto University, Japan

Tetsuro Matsuzawa
Tatyana Humle
Yukimaru Sugiyama

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Contributors

Dora Biro (*Chapters 17 and 25*)

Department of Zoology, University of Oxford, South Parks Road, Oxford OX1 3PS, UK

Blandine Bril (*Chapter 20*)

École des Hautes Études en Sciences Sociales, 54 Bd Raspail, 75006 Paris, France

Susana Carvalho (*Chapters 15 and 30*)

Leverhulme Centre for Human Evolutionary Studies, Department of Biological Anthropology, University of Cambridge, Henry Wellcome Building, Fitzwilliam Street, Cambridge CB2 1QH, UK

Gilles Dietrich (*Chapter 20*)

Université Paris Descartes, 1 rue Lacretelle, 75015 Paris, France

Shiho Fujita (*Chapters 3 and 36*)

Department of Veterinary Medicine, Faculty of Agriculture, Yamaguchi University, Yoshida 1677-1, Yamaguchi 753-8515, Japan

Nicolas Granier (*Chapters 29, 37, 39 and Appendix G*)

Behavioral Biology Unit, Department of Environmental Sciences, University of Liège, Quai Van Beneden, 22, 4020 Liège, Belgium

Misato Hayashi (*Chapters 18 and 19*)

Primate Research Institute, Kyoto University, 41-2 Kanrin, Inuyama, Aichi 484-8506, Japan

Satoshi Hirata (*Chapters 14, 19 and 20*)

Great Ape Research Institute, Hayashibara Biochemical Laboratories, Inc., 952-2 Nu, Tamano, Okayama 706-0316, Japan

Kimberley Jane Hockings (*Chapters 22 and 23*)

Department of Anthropology, Faculty of Social and Human Sciences, New University of Lisbon, Avenida de Berna, 26-C, 1069-061 Lisbon, Portugal
and
Department of Psychology, Stirling University, Stirling, UK

Tatyana Humle (*Chapters 1, 2, 6, 9, 11, 12, 27, 32, 37, 38, 40 and Appendix B*)
School of Anthropology and Conservation, The Marlowe Building, University of Kent, Canterbury CT2 7NR, UK

Noriko Inoue-Nakamura (*Chapter 18*)
Showa Women's University, 1-7 Taishido, Setagaya-ku, Tokyo 154-8533, Japan

Asami Kabasawa (*Chapter 5*)
Graduate School of Asian and African Area Studies, Kyoto University,
46 Shimoadachi-cho, Yoshida, Sakyo-ku, Kyoto 606-8501, Japan

Kathelijne Koops (*Chapter 28*)
Department of Biological Anthropology, Leverhulme Centre for
Human Evolutionary Studies, University of Cambridge, Fitzwilliam Street,
Cambridge CB2 1QH, UK

Rebecca Kormos (*Chapter 40*)
1170 Grizzly Peak Blvd, Berkeley, CA 94708, USA

Makan Kourouma (*Chapter 37*)
Institut de Recherche Environnementale de Bossou, Bossou, Republic of Guinea

Laura Martinez (*Chapter 39 and Appendix G*)
Research Institute of EcoScience, Ewha Womans University, B 365, Science
Building,
11-1 Daehyun-Dong, Seodaemun-Gu, Seoul 120-750, Republic of Korea

Tetsuro Matsuzawa (*Chapters 1, 7, 11, 12, 13, 16, 21 and 37*)
Primate Research Institute, Kyoto University, 41-2 Kanrin, Inuyama,
Aichi 484-8506, Japan

Yuu Mizuno (*Chapter 14*)
Department of Children, Faculty of Children Studies, Chubu-Gakuin University,
30-1 Nakaoita, Kakamihara, Gifu 504-0837, Japan

Masako Myowa-Yamakoshi (*Chapter 24*)
Graduate School of Education, Kyoto University, Yoshida-honmachi, Sakyo,
Kyoto 606-8501, Japan

Michio Nakamura (*Chapter 26*)
Wildlife Research Center of Kyoto University, 2-24 Tanaka-Sekiden-cho, Sakyo,
Kyoto 606-8203, Japan

Gaku Ohashi (*Chapters 31, 37, Appendices A and D*)
Japan Monkey Centre, Inuyama, Aichi 484-0081, Japan
and
Primate Research Institute, Kyoto University, 41-2 Kanrin, Inuyama,
Aichi 484-8506, Japan

Makoto K. Shimada (*Chapter 34 and Appendix E*)

Primate Research Institute, Kyoto University, 41-2 Kanrin, Inuyama,
Aichi 484-8506, Japan
and

National Institute of Genetics, Mishima 411-8540, Japan
and

Institute of Comprehensive Medical Science, Fujita Health University,
1-98 Dengakugakubo, Kutsukake-cho, Toyoake, Aichi 470-1192, Japan

Aly Gaspard Soumah (*Chapter 37*)

Institut de Recherche Environnementale de Bossou, Bossou, Republic of Guinea

Cláudia Sousa (*Chapter 8*)

Department of Anthropology, Faculty of Social and Human Sciences,
New University of Lisbon, Avenida de Berna, 26-C, 1069-061 Lisbon, Portugal
and

Centre for Research in Anthropology (CRIA), Avenida das Forças Armadas,
Edifício ISCTE, 1049-029 Lisbon, Portugal

Yukimaru Sugiyama (*Chapter 3*)

Primate Research Institute, Kyoto University, 41-2 Kanrin, Inuyama,
Aichi 484-8506, Japan

Hiroyuki Takemoto (*Chapter 33 and Appendix C*)

Primate Research Institute, Kyoto University, 41-2 Kanrin, Inuyama,
Aichi 484-8506, Japan

Kazunari Ushida (*Chapter 35 and Appendix F*)

Laboratory of Animal Science, Graduate School of Life and Environmental
Sciences, Kyoto Prefectural University, Shimogamo, Kyoto 606-8522, Japan

Gen Yamakoshi (*Chapters 4, 10, 11, 12 and 24*)

Graduate School of Asian and African Area Studies, Kyoto University,
46 Shimoadachi-cho, Yoshida, Sakyo-ku, Kyoto 606-8501, Japan

Shinya Yamamoto (*Chapter 12*)

Primate Research Institute, Kyoto University, 41-2 Kanrin, Inuyama,
Aichi 484-8506, Japan
and

Great Ape Research Institute, Hayashibara Biochemical Laboratories, Inc., 952-2
Nu, Tamano, Okayama 706-0316, Japan

About the Accompanying DVD Compilation

This book offers a unique DVD compilation of video clips of Bossou chimpanzees (*Pan troglodytes verus*) using tools and performing various other behaviors referred to in this volume. This exceptional visual ethogram includes examples of algae scooping and pestle pounding, as well as water drinking with folded leaves from tree holes. These behaviors represent tool-use signatures of the Bossou chimpanzee community and have therefore never been recorded elsewhere. Video footage also describes stone-tool selectivity and transport, as well as metatool use, i.e., the use of a third stone as a wedge to balance an unstable anvil stone in the process of oil palm nut cracking.

The viewer may also watch clips of the coula nut experiment, which has yielded invaluable insights into cultural transmission among chimpanzees, as well as the variety of ant-dipping techniques targeted at army ants (*Dorylus* sp.) displayed by members of this community. In addition, the DVD contains unique clips portraying examples of deception, of fruit sharing among adults, and of palm-wine drinking with leaves, in addition to education-by-master apprenticeship in action with regard to nut



Fig. 1 Video footage of nut cracking of oil palm nuts (*Elaeis guineensis*) being collected in the outdoor laboratory on the top of the Hill of Gban in the core area of the Bossou chimpanzee community (photograph by Dora Biro)

cracking and water drinking. Cross-sectional clips permit the viewer to appreciate the sequential stages involved in the ontogeny of these tool-use behaviors.

Included is also a range of video footage depicting the unique features of the mother–offspring bond and the complex array of communicative and playful behaviors that shape social interactions among members of this community. Some clips also illustrate their nesting, feeding, and processing skills.

This DVD additionally provides glimpses into the coexistence that exists between humans and chimpanzees at Bossou. Bossou chimpanzees have indeed evolved several behavioral adaptations to crossing roads with minimal risk and to other anthropogenic modifications and threats to their habitat, e.g., crop raiding. In combination with the array of chapters and themes addressed in this volume, this DVD is a perfect complement further illustrating the intelligence and behavioral flexibility of this unique community of chimpanzees located in southeastern Guinea, West Africa.

We are extremely grateful to Miho Nakamura for putting together this DVD compilation based on video archive contributions from ANC Productions Inc., Japan, Tetsuro Matsuzawa, Tatyana Humle, Gaku Ohashi, Kimberly Hockings, and Gen Yamakoshi.

Color Plates

1. An infant female chimpanzee (Joya) gazing at human observers. Photo by Kathelijne Koops.
2. Two chimpanzees (Yolo and his elderly mother, Yo) vocalizing in a tree. Photo by Pascal Goumy.
3. A young male chimpanzee (Jeje) performing algae scooping. Photo by Henry Didier Camara.
4. A young male chimpanzee (Peley) sitting on a tree trunk. Photo by Henry Didier Camara.
5. Two chimpanzees (Tua and Yo) screaming. Photo by Pascal Goumy.
6. An adult male chimpanzee (Yolo) grooming the back of a female chimpanzee (Fanle), who is cracking nuts. Photo by Jules Gondo Doré.
7. A young mother (Fanle) cracking nuts while holding her son (Flanle). Photo by Jules Gondo Doré
8. Male chimpanzees (*left to right*: Yolo, Foaf, and Peley) cracking nuts in the outdoor laboratory. Photo by Henry Didier Camara.
9. Nimba Mountains in the mist. Photo by Kathelijne Koops.
10. A young male chimpanzee (Jeje) crossing a road under the observation of a researcher and a local guide. Photo by Henry Didier Camara.
11. An infant male chimpanzee (Flanle) held by his mother (Fanle) in a tree. Photo by Kathelijne Koops.
12. A mother–infant chimpanzee pair (Jire and Joya) looking back while crossing a narrow path. Photo by Etsuko Nogami.





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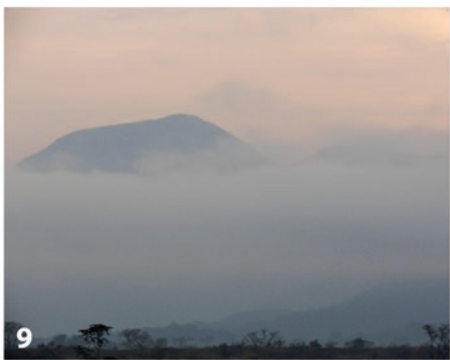
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Part I
Introduction

Chapter 1

Bossou: 33 Years

Tetsuro Matsuzawa and Tatyana Humle

1.1 Outline of Chimpanzee Research at Bossou

A small group of chimpanzees inhabits the forested hills surrounding the village of Bossou in southeastern Guinea, West Africa. Over the years, cultural primatology has driven much of the research on this unique group of wild chimpanzees.

The village of Bossou is located west of the Nimba Mountains, the only World Natural Heritage site (UNESCO/MAB) in Guinea (see Chaps. 27, 28, 29, 39, and 40). The highest peak in the Nimba Mountains, which is 1,752 m above sea level, is a landmark in West Africa. This region of Guinea is known as Forest Guinea (Guinée Forestière) and belongs to the Upper Guinea forest ecosystem that extends from southern Guinea into Sierra Leone and eastward from Liberia to Western Togo. The Upper Guinea forests constitute a major African biodiversity hotspot (Myers et al. 2000). From these forests originate major rivers including the Niger, the Gambia, and the Senegal. The region of Bossou and the Nimba Mountains is truly located at the center of the Upper Guinea Forest network, at the crossroads between Guinea, Côte d'Ivoire, and Liberia.

The Republic of Guinea (République de Guinée in French), formally known as French Guinea, or also referred to today as Guinea-Conakry or simply Guinea, was a French colony that acquired its independence in 1958. The country's current population is estimated to be a little more than ten million inhabitants (CIA 2008). The 1997 census estimated the population at about seven million. The country has therefore experienced significant population increase and consequent mounting demographic pressure during the last decade. Guinea extends across 245,857 km² (94,926 square miles), which corresponds in size to the state of Michigan in the USA or to about two-thirds of the surface area of Japan. The population density is

T. Matsuzawa (✉)

Primate Research Institute, Kyoto University, 41-2 Kanrin, Inuyama, Aichi 484-8506, Japan
e-mail: matsuzaw@pri.kyoto-u.ac.jp

T. Humle

School of Anthropology and Conservation, The Marlowe Building, University of Kent,
Canterbury CT2 7NR, UK

about 38 individuals per square kilometer. Guinea is curve shaped, limited on its western front by the Atlantic Ocean; the country extends eastward inland before tipping south toward Sierra Leone and Liberia on its eastern front. Guinea borders to the north with Guinea-Bissau and Senegal, to the northeast with Mali, to the southeast with Côte d'Ivoire, and to the south with Liberia and Sierra Leone.

During the French colonization and thereafter, French and Dutch scholars carried out early studies of the fauna and flora, including chimpanzees, in and around the Nimba Mountains (Kortlandt 1986; Lamotte and Roy 2003) (see Chaps. 4 and 39). In November 1976, Yukimaru Sugiyama of the Kyoto University Primate Research Institute carried out his first long-term field study of Bossou chimpanzees (Sugiyama and Koman 1979a, b). At the time, the country was still governed by Ahmed Sékou Touré, the first post-independence president of the country. Sugiyama carried out field surveys for 4–7 months three times during the first 10 years. In those days, Guinea primarily maintained international relations with Eastern Bloc countries and had a closed economy, rendering it difficult to conduct in situ fieldwork.

In February 1986, Tetsuro Matsuzawa began field research at Bossou alongside Yukimaru Sugiyama. Since then, many researchers from the Kyoto University Primate Research Institute (KUPRI) have contributed in a joint effort to study the chimpanzees of Bossou and the Nimba Mountains and to promote the conservation of their habitat (Matsuzawa 2006a, b, c). In July 1995, Tatyana Humle joined the KUPRI team as the first non-Japanese scientist. Since then, the research team has grown to become increasingly international.

At present, the international team of researchers, known as KUPRI-International, continues to contribute to the long-term research of the Bossou–Nimba chimpanzees. The research is based on a formal convention between KUPRI and two Guinean authorities: the Direction Nationale de la Recherche Scientifique et Technologique (DNRST) and Institut de Recherche Environnementale de Bossou (IREB). The two institutions represent the official counterparts of the scientific collaboration between KUPRI and the Guinean government.

In December 2008, the president Lansana Conte, who had been in power since 1984, passed away. Captain Moussa Dadis Camara subsequently took over until December 2009, after falling victim to an assassination attempt. This event forced him to abandon his position as president. Even though the situation of the country remains unstable, the collaboration between KUPRI and the Guinean authorities has remained strong.

The chimpanzees of Bossou have numbered around 20 individuals for decades since the advent of research in 1976 (see Chaps. 3 and 4). This community possesses quite remarkable life history (see Chap. 3), genetic (see Chap. 34), and physiological (see Chap. 35) features. It is also well known for its use of a variety of different tools (see Chaps. 6 and 16), including a stone hammer and a stone anvil to crack open oil-palm nuts (Biro et al. 2003; Matsuzawa 1994) (Fig. 1.1). At Bossou, nut-cracking has not only been studied from a developmental perspective (see Chaps. 18, 21, and 24), complemented by studies in captivity (see Chaps. 19 and 20), but also from an archeological (see Chaps. 7 and 15) and cultural (see Chap. 17) perspective, supplemented by field studies in surrounding areas, including