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ORANG-UTANS AND GIBBONS COMPARED: IMPLICATIONS OF DIFFERENCES IN FEEDING AND BEHAVIOURAL ECOLOGY FOR CONSERVATION.

ASIAN APES – PROTECTING THE LAST GREAT REFUGE OF GIBBONS (*HYLOBATES ALBIBARBIS*) AND ORANG-UTANS (*PONGO PYGMAEUS WURMBII*)

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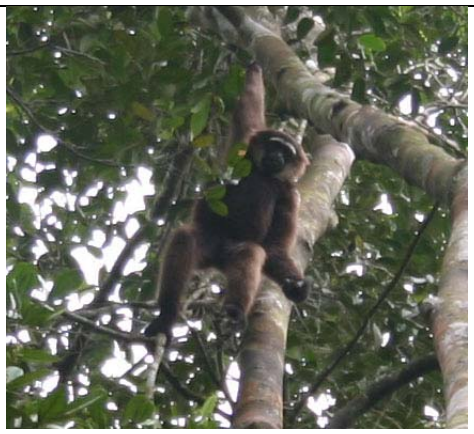

Introduction

The Sabangau Ecosystem has been designated as a National Park, but the real conservation challenges are just beginning. The area has been protected primarily to conserve the world's largest population of Bornean orang-utan, *Pongo pygmaeus* - 6900 individuals in an area of 578,000 hectares of peat swamp forest (Singleton *et al.*, 2004, Husson *et al.*, in prep.) - and one of the largest populations of Bornean agile gibbon, *Hylobates agilis albibarbis* (Cheyne *et al.*, in press). The habitat has undergone many years of uncontrolled illegal logging and has experienced several severe fire events. The long-term effects of this habitat degradation are unclear but are certain to be detrimental to the long-term integrity of the ecosystem unless mitigating activities are undertaken. Abandoned timber extraction canals are draining the ecosystem, increasing the risk of peat collapse and further fires. A recent cessation in logging activity has occurred, owing to the activities of the CIMTROP (Centre for the International Cooperation in Management of Tropical Peatlands) Patrol Team, the National Park designation; some strong words by the Indonesian President against illegal logging and consequent heightened police activity - but this is by no means secure for the long-term. Exploitation of the forest and its wildlife remains a concern; particularly as many of the surrounding populace previously relied on logging as their major source of income. This list of problems provides a clear indication that many conservation initiatives are required.

Several projects are planned or are underway. CIMTROP maintain a large and well-equipped research station in the Natural Laboratory for the study of Peat Swamp Forest (NLPSF) at which scientists from the University of Palangkaraya, the Indonesian Institute of Scientists (LIPI) and international universities carry out research. CIMTROP maintains a logging patrol and forest protection unit in the upper Sabangau and the Forestry Department are developing river-patrol units. CIMTROP and WWF-Indonesia are working on closing the timber extraction canals in order to restore natural hydrological conditions. For environmental education and awareness, CIMTROP are working in the northern Sabangau area, Yayasan Cakrawala Indonesia have a project underway in the Katingan region; and WWF-Indonesia maintain a media awareness campaign. CIMTROP and WWF-Indonesia are working on community programs including the development of alternative income projects focusing on non-timber forest products and other sources of employment that do not depend on forest exploitation. The Kalaweit Gibbon Rehabilitation Project run projects on anti-hunting and anti-pet trade projects and the provincial government, assisted by CIMTROP, continues to develop forest-fire awareness and fire-fighting capabilities.

It is expected that these priorities and projects will be integrated in the form of a management plan, to be developed with guidelines for long-term conservation of the Sabangau National Park. This plan will lay out explicit conservation goals and describe the policies, protocols and practices required to achieve those goals. Monitoring, research and evaluation are frequently neglected in protected area planning, but are crucial components of active management, which requires regular evaluation and assessment of the effectiveness of the management structure, conservation activities and community participation in achieving the desired conservation outcomes.

Study area

The River Sabangau Catchment occupies an area of ca. 5,780km^2 of forest in Central Kalimantan, Indonesia. Recently (October 2004), most of the catchment (5,680km$^{2)}$, was designated a national park. The park was established to protect one of the most important populations of orang-utan remaining and represents a renewed commitment on the part of the Indonesian government to protect this species. Our research was conducted in the NLPSF in the northeast of the park (Figure 1). This site is owned and operated by CIMTROP. It was established in 1996, before which it was a logging concession camp and, as such, the surrounding research area has been subject to high levels of past disturbance. A grid system has been constructed for research purposes in the marginal mixed-swamp forest, the largest habitat sub-type in Sabangau. Detailed flora and fauna species lists exist for the area (Shepherd et al., 1997; Page et al., 1999; Husson and Morrogh-Bernard, unpublished data, Cheyne and Harrison, unpublished data).

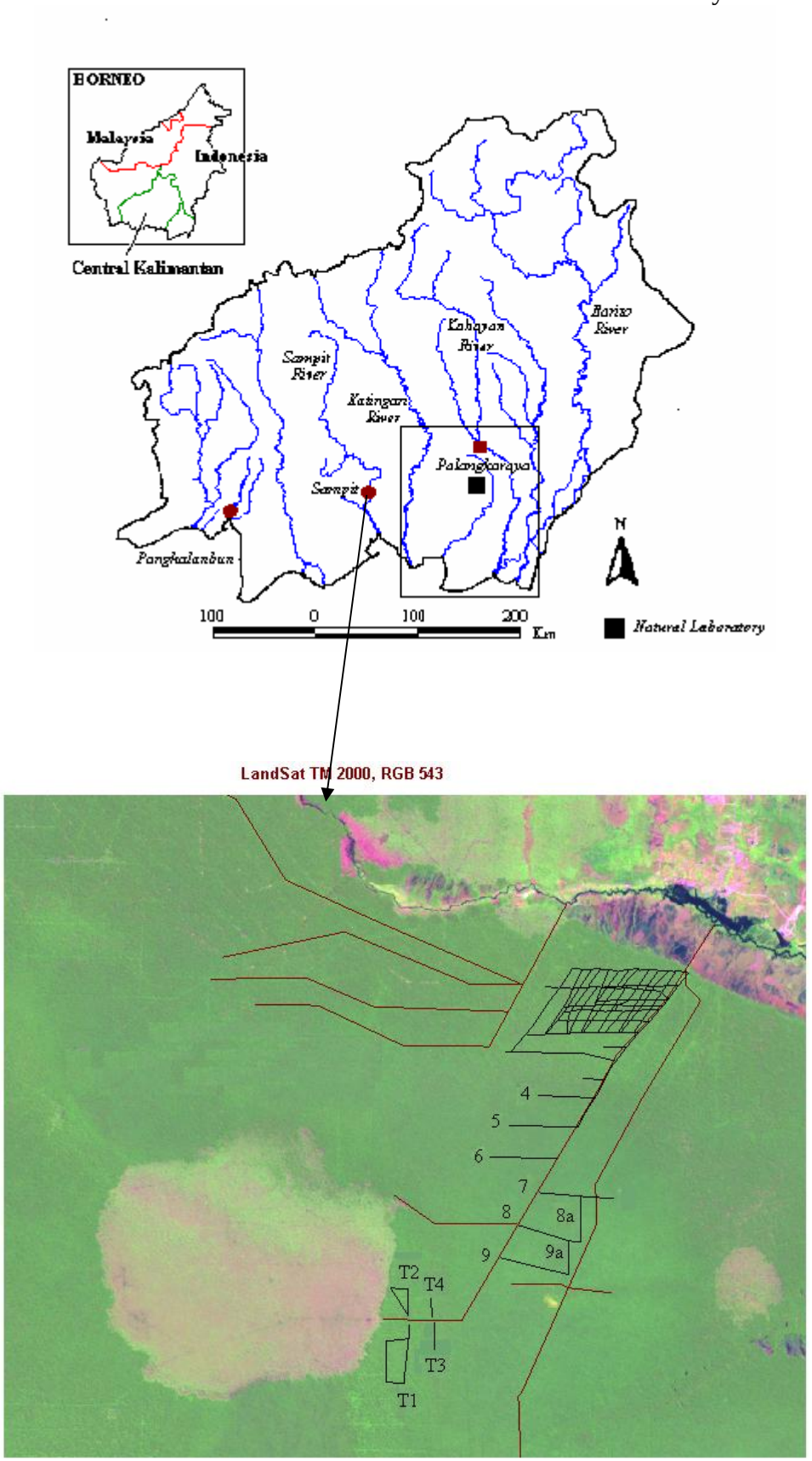

Figure 1 Location of NLPSF and the study grid system.

Goals

- To identify and compare orang-utan and gibbon ecological requirements in order to maintain a positive energy balance in logged peat-swamp forest.
- To identify the effects of logging disturbance on orang-utans and gibbons in the Sabangau, in particular with regard to food availability and locomotion.
- To provide the Indonesian National Park Authority with information vital to assessing the success of the park and for developing species-specific management plans.

Specific aims

- To identify the foods/tree species of greatest importance for ensuring the continued survival of the orang-utan and gibbon in the Sabangau, i.e. those species providing the greatest energy contribution overall and in times of greatest food stress.
- To identify how orang-utan and gibbon energy intake varies in relation to food-energy availability, and whether animals' energy balances becomes negative during periods of food stress.
- To identify the effects of canopy gaps on the two species' travel, i.e. to identify how well they cope with large canopy gaps.
- To identify how gibbon travel behavior in Sabangau (disturbed) differs from gibbon travel behaviour in Gunung Palung (pristine, Cannon & Leighton, 1994).
- To assess how differences in the two species' behaviour (activity profiles, ranging) varies between seasons and may influence their susceptibility to logging disturbance.

Methods (design and implementation)

- Focal-animal follows are being continued (based on standardized methods outlined by Cheyne (2004) for gibbons and by Morrogh-Bernard (2003) for orang-utans) to establish monthly/seasonal dietary composition, dietary differences and overlap, and monthly/seasonal activity profiles.
- Gibbon and orang-utan food species lists for Sabangau are nearing completion and reports have been submitted. SMC and Mark E. Harrison (University of Cambridge, Co-PI on this study) are collecting detailed feeding data (including feeding rates and percentage eaten) and conducting nutritional analysis for these foods (all following Knott, 1998, see also Cheyne et al., in press). Where possible, samples of all foods are being collected and dried in a kerosene oven at 40^{o}C, until a constant weight is obtained. Wet and dry weights are being recorded.

- Nutritional analyses are being conducted at the LIPI (Indonesian Institute of Sciences) nutritional laboratory in Bogor, Java, under the supervision of Dr W. Rosa Farida. The methods used in this laboratory follow Knott (1998).
- Daily energy intake is being calculated following Knott (1998) – is no app A
- Monthly forest productivity surveys are being conducted to monitor food availability. Six plots are being monitored for the number of fruits/flowers/young leaves using binoculars following methods established in 2003 (Morrogh-Bernard, 2003). Total plot area is 2.4 ha and all plots are located in the same habitat sub-type (mixed-swamp forest) as focal-animal follows. All tree species in these plots have been identified (in most cases to species level) by professional botanists and local experts. In combination with nutrient data, this will enable density of 'fruiting' species and orang-utan/gibbon food-energy production/ha (Knott, 2005) to be established. This will then be compared to the two species' diets, energy intake, activity profiles and ranging, in order to achieve the stated goals.
- By June 2007, we have collected 2years of detailed forest productivity, feeding and nutritional data will exist, incorporating one wet and two dry seasons.
- Analysis of PCI (Cannon & Leighton, 1994), which predicts the relative use of canopy strata, is being conducted for both species. The index is calculated based on the percentage of gaps that a species can cross, the frequency of gaps and the median length of continuous canopy structure in each canopy layer. Gibbon travel and habitat data collection for use in the PCI model have already been completed and orang-utan data are currently being collected under MEH's supervision. This will represent the first data on orang-utan Perceived Continuity Index (PCI) from any site, the first gibbon PCI data from peat-swamp and disturbed forest, and the first orang-utan-gibbon PCI comparison.
- Gibbon PCI was first studied in Gunung Palung National Park, West Kalimantan, an area of pristine forest at the time of the study (Cannon & Leighton, 1994). Our data will be compared to Cannon and Leighton's to see how gibbon PCI differs between the pristine Gunung Palung and disturbed Sabangau, and whether gibbon travel, and hence energy budget, is compromised in Sabangau due to greater gap size/frequency. No data on orang-utan PCI from other sites exists.
- Orang-utan/gibbon activity (feeding, traveling, resting, socializing, etc.) is being recorded at five-minute intervals throughout the day. All food species are recorded and all trees are tagged to measure revisitation rates. Food trees are identified with the aid of knowledgeable local assistants, tree species lists and descriptions made up by S. Husson and H. Morrogh-Bernard, and CIMTROP botanists. Detailed maps (hand-drawn and backed up using GPS) are made of travel routes and distance traveled between each five-minute activity point is recorded, which will allow us to accurately describe ranging behavior.

Results

In addition to the important work on the apes, we are also focusing our efforts on understanding other species and the forest ecosystem as well as participating in educational campaigns and helping develop fire-fighting teams.

Ape Behaviour Study

Our density surveys have identified this area as supporting the largest population of orang-utan in the world (~7000 individuals) and probably the largest population of gibbons in Indonesia (~30,000 individuals). We have habituated seven gibbon groups and one lone male and 21 orang-utans. 147 species of food have been processed using the physico-chemical field kit to obtain information on mechanics and chemical properties of ape foods, and 189 food samples from 75 food species have been collected for nutritional analysis in the laboratory. The interactions between the apes and the forest are the overarching aim of this study.

We have collected the following data sets:

- We have processed 147 species (453 samples) through a physico-chemical field-kit to assess toughness, Young's modulus, pH and size of all parts eaten and parts not eaten by the apes.
- Since the start of the project in June 2005, we have collected 1000 hours of gibbon behaviour and over 4,000hours of orang-utan behaviour data. These data sets include detailed feeding behaviour, species consumed at different times of year and feeding rate (intake) data.
- We have sent 189 food samples from 75 food species to the Indonesian Institute of Science lab for nutritional analysis (fat, protein, fibre and energy contents) in the laboratory..
- Our analyses have revealed information on feeding competition between gibbons and orang-utans – currently food overlap is at 73% but encounter rates are low (6%).
- In the dry season gibbons are showing a large shift in dietary composition with flowers compromising about 80% of the diet, compared to 10% during wet season. This represents a dietary shift on a scale not known from elsewhere. (correct?)
- Lists of the most important species for both apes have been produced at the request of the Indonesian Forestry Department (see Appendix 1)
- Indonesian field staff have been trained in data collection, with computer use and are assisting with data entry.
- We have supplied several local Indonesian NGO's with photos and material about the apes for them to use in their education campaigns.

We have started data analysis to identify the following:

- Ape fallback foods i.e. which foods are most important to them in times of low food availability.
- Important (important and preferred foods not to be confused – two different things) foods i.e. which are the most important to the apes for overall survival
- Energy budgets i.e. how much of the foods do the apes need to survive and reproduce successfully
- Ranging of the apes is being more fully understood.
- Social behaviour among both apes is being explored.

Local professional involvement

This project was carried out in collaboration with CIMTROP, University of Palangka Raya. CIMTROP students and staff were trained in field methods, data input and data analysis techniques. We are currently seeking an Indonesian to manage the project and data collection. We are working with two Indonesian researchers who are seeking sponsorship for masters projects. We are assisting with reference letters, methods and correcting the English for these students.

Involvement of local people

Five local assistants are presently employed on a permanent contract through CIMTROP. These assistants are invaluable to this study, having already been trained in all aspects of the research project. Support staff from the local village are employed to help with grid system maintenance, camp cooking, security and river transport.

Education/public information

We work with the CIMTROP education division to facilitate dissemination of the results of the project to local people. Regular reports will be submitted to the Indonesian Institute of Sciences (LIPI) and the Indonesian Department of Forestry (PHKA). Local environmental education groups are worked with closely. The CIMTROP Education Project, the Nyaru Menteng Education Project, OCCEF and the Kalaweit Gibbon Education Team are given information to incorporate into their education programmes and for use on the Kalaweit Radio Station (broadcast to about 1,000,000 plus internet listeners in Indonesia and around the world). Data are made available to national and local government in the form of translated reports, where it is hoped that data from this study can be used to help with management plans for other protected areas in Indonesia.

The gibbon research (Dr Susan Cheyne) will be featured on BBC 1 as part of the Saving Planet Earth series on July 3rd at 1700h. The orang-utan research (Mark Harrison) was featured on MSNBC on 14th May and is due to feature on local television (TVRI) later this/next month, which represents a great opportunity to spread the conservation message to a local audience.

Post-project conservation action

The continued presence of conservationists and researchers is essential to push for the implementation of conservation measures and law enforcement, to monitor the effectiveness of conservation measures and to take appropriate actions to improve management strategies. Translated reports on our findings will be presented to the Forestry Department, CIMTROP, LIPI and other interested parties. As researchers, this is the most valuable contribution we can make: to ensure the local authorities and decision makers are equipped with comprehensive and up-to-date information on the status and biology of target conservation species. Recently, we were commissioned to produce a report for the Forestry Department on how best to conserve peat-swamp forest to preserve its biodiversity and, especially, its primate populations Appendix 1). It is hoped that this report will lead to new regulations on which trees can and cannot be harvested in production forests, with increased protection being given to those species of particular importance to orang-utans and gibbons. This was an excellent opportunity for us to make a real contribution towards protection of orang-utans and gibbons, both in Sabangau and beyond.

Furthermore, this study on sympatric orang-utans and gibbons is providing a unique insight into how these apes cope with the uncertain food supply in the Sabangau peat swamp, and will form part of long-term data sets for these species. Such long-term data are important for monitoring the affects of changes in disturbance and management practice in an area, as without this type of research, it is impossible to say whether management strategies and resources spent on conservation efforts are effective (e.g., Parrish et al., 2003). The risks of continued habitat disturbance are being identified, sowing the seeds for long-term monitoring of the health of the orang-utan and gibbon populations. This will allow conservationists to predict the effects of sudden changes in the ape populations on the park.

The future

In the coming year we hope to continue the important ape behaviour work as well as expand our efforts:

- Seed dispersal – understanding germination rates of seeds which have passed through the guts of the apes
- Begin a study on germination rates of seeds which have passed through the guts of orang-utans and gibbons. This may help determine the importance of the apes in seed dispersal and forest regeneration.
- Increase the number of species being studied in the area to ensure that we have information on a broad range of species. Only with data from all guilds of the ecosystem can we provide accurate management suggestions to the Department of Forestry.

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APPENDIX 1

Important Tree Species for Gibbons in the Sabangau Peat Swamp Forest

Report for the Indonesian Department of Forestry (PHKA)

By:

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February 2007

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The Sabangau peat swamp forest, Central Kalimantan is probably home to the largest remaining contiguous population of Bornean agile gibbon (*Hylobates agilis albibarbis*) in the world, and is likely to be one of the largest remaining populations of gibbons in Indonesia. The Sabangau gibbon population is estimated at 30,000 individuals (Cheyne *et al.*, submitted). This area is vital for global conservation of this species. Wet season gibbon diet in the Sabangau is consistent with other published studies, but shows marked variation during the dry season, when the gibbons rely on leaves and flowers far more than at any other study site. Data here are based on 17 months of data, equivalent to 976 hours of follows hours (September 2005-February 2007).

Over 289 species of plant have been identified to species level in collaboration with the CIMTROP (Centre for the International Cooperation in Management of Tropical Peatlands) Herbarium, of which 65 have been identified as gibbon food species in the past 12 months (it is likely that more species will be identified as the gibbon study progresses).

Gibbons were followed from when they were encountered to when they were lost or, where possible, to night sleeping tree. The name of food species eaten and length of time these species were fed on were recorded following standardised methods (Cheyne, 2004; Cheyne and Brulé, 2004).

In order to identify which tree species were important to gibbons, all feeding data was weighted by the number of hours followed per month in order to reduce any bias in seasonality (Table 1). In order to identify which species were important at specific times of year, the three most important species eaten in any one month were identified (Table 2).

Of the 65 species of plant identified as gibbon food, all were trees, figs or woody lianas (except for one species of unidentified epiphyte). Eighty-three percent of all feeding time is on just twenty species. These 20 species are listed in rank order of importance (Table 1), and are from the plant families Anacardiaceae, Annonaceae, Apocynaceae, Ebenaceae, Euphorbiaceae, Gnetaceae, Icacinaceae, Moraceae, Myrtaceae, Sapindaceae, Sapotaceae and Tetrimeristaceae.

Some of these families, eg. Annonaceae and Moraceae, contain species which have an asynchronous fruiting cycle, i.e. the trees do not all fruit at the same time, thus providing food for gibbons nearly all year round. They are therefore extremely important for gibbons during the low fruiting months.

Table 1. Top 20 species eaten by gibbons ranked by percentage of time feeding.

Rank	Family	Species	Local name	% total feeding weighted by follow effort/month
1	Myrtaceae	*Syzygium garcinfolia*	Jambu Buring	11.2
2	Ebenaceae	*Diospyros bantamensis*	Malam Malam	10.04
3	Moraceae	*Parartocarpus venenosus*	Lilin Lilin	7.34
4	Sapotaceae	*Palaquium sp. 3*	Nyatoh Burung	6.32
5	Clusiaceae	*Mesua sp 1*	Tabaras akar tinggi	5.54
6	Anacardiaceae	*Campnosperma coriaceum*	Terantang	4.56
7	Sapotaceae	*Palaquium cochlearifolium*	Nyatoh Gagas	4.05
8	Gnetaceae	*Gnetum sp. 1*	Bajakah Luaa	3.90
9	Moraceae	*Ficus sp.*	Lunuk Buhis	3.49
10	Moraceae	*Ficus sp.*	Lunuk Bunyer	3.27
11	Sapotaceae	*Palaquium pseudorostratum*	Nyatoh Babi	3.15
12	Sapotaceae	*Madhuca mottleyana*	Katiau	3.06
13	Annonaceae	*Mezzettia umbellate*	Pisang Pisang (Kambalitan Hitam)	2.66
14	Tetrimeristaceae	*Tetramerista glabra*	Pornak	2.65
15	Apocynaceae	*Dyera lowii*	Jelutong	2.36
16	Sapindaceae	*Nephellium lappaceum*	Rambutan Hutan	2.22
17	Sapotaceae	*Palaquium cf. xanthochymum*	Nyatoh Burung	2.10
18	Euphorbiaceae	*Blumeodendron kurzii*	Kenari	1.81
19	Moraceae	*Ficus sp.*	Lunuk Sambon	1.57
20	Apocynaceae	*Alyxia*	Bajakah Kelanis	1.50

These twenty species are thus critical components of gibbon diet in the Sabangau.

Additionally, there are species which do not form a large part of gibbon diet overall, but are important at certain times of year. The three most-eaten species in each month were identified for each of the 12 months of the study (Table 2). These species include 16 of the 20 species in Table 1. There are six additional species including *Garcinia bancana*. These species are either favoured when they come into season, or important fall-back foods when more preferred species are not in fruit. *Diospyros bantamensis* was in the top three species for 5 months of the year (fruit) and *Palaquium cochlearifolium* (flowers) and *Syzygium garcinfolia* (fruit) for three months of the year and are therefore extremely important foods for gibbons in Sabangau.

Table 2 – Seasonally important species. Species not in top 20 highlighted in yellow.

Family	Species	Local name	Overall ranking	Number of months (out of 12) where species is in top 3 foods
Ebenaceae	*Diospyros bantamensis*	Malam Malam	2	5
Sapotaceae	*Palaquium cochlearifolium*	Nyatoh Gagas	7	3
Myrtaceae	*Syzygium garcinfolia*	Jambu Buring	1	3
Gnetaceae	*Gnetum sp. 1*	Bajakah Luaa	8	2
Clusiaceae	*Mesua sp 1*	Tabaras akar tinggi	5	2
Clusiaceae	*Garcinia bancana*	Manggis	28	2
Moraceae	*Parartocarpus venenosus*	Lilin Lilin	3	2
Anacardiaceae	*Campnosperma coriaceum*	Terantang	6	2
Sapotaceae	*Palaquium sp. 3*	Nyatoh Burung	4	2
Moraceae	*Ficus sp.*	Lunuk Bunyer	10	1
Moraceae	*Ficus sp.*	Lunuk Buhis	9	1
Annonaceae	*Mezzettia umbellata*	Pisang Pisang (Kambalitan Hitam)	13	1
Myrtaceae	*Syzygium havilandii*	Tatumbu	25	1
Euphorbiaceae	*Blumeodendron kurzii*	Kenari	18	1
Sapotaceae	*Madhuca mottleyana*	Katiau	12	1
Sapotaceae	*Palaquium pseudorostratum*	Nyatoh Babi	11	1
Tetrimeristaceae	*Tetramerista glabra*	Pornak	14	1
Sapindaceae	*Nephellium lappaceum*	Rambutan Hutan	16	1
Elaeocarpaceae	*Elaeocarpus mastersii*	Mangkinang	27	1
Gnetaceae	*Gnetum sp. 2*	No local name	47	1
Clusiaceae	*Callophyllum hosei*	Bintangor/jinjit/mentangor	23	1
Menispermaceae	*Fibraurea tinctoria*	Liana Kuning	38	1

Meliaceae	*Aglaia rubiginosa*	Kajalaki	42	1
Meliaceae	*Sandoricum beccanarium*	Papong	21	1
Fabaceae	*Koompassia malaccensis*	Kempas	51	1
Annonaceae	*Polyalthia hypoleuca*	Alulup (Rewoi)	36	1
Clusiaceae	*Garcinia cf. parvifolia*	Gandis	53	1
Polygalaceae	*Xanthophyllum cf. ellipticum*	Kemuning	30	1
Anacardiaceae	*Campnosperma squamatum*	Nyating	22	1

Some of the food species listed here as important orang-utan foods differ from the species reported by Morrogh-Bernard et al. (2006) as being important for orang-utans in Sabangau. This difference is partly true, but is also due to the larger data set for orang-utans and different study periods. Simultaneous data currently being collected in Sabangau will allow more concrete conclusions on the differences and similarities between the two species to be drawn. These data will be presented in a second report to be submitted towards the end of next year. Until this time, we advise that those species reported by Morrogh-Bernard et al. (2006) as important orang-utan foods should also be considered as important gibbon foods.

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Appendix A

Following is a complete list of all floral species eaten by gibbons in Sabangau. Feeding time indicates percentage feeding time on each species, weighted by follow effort/month.

Rank	Family	Species	Local name	% total feeding weighted by follow effort/month
1	Myrtaceae	*Syzygium garcinfolia*	Jambu Buring	11.92
2	Ebenaceae	*Diospyros bantamensis*	Malam Malam	10.04
3	Moraceae	*Parartocarpus venenosus*	Lilin Lilin	7.34
4	Sapotaceae	*Palaquium sp. 3*	Nyatoh Burung	6.32
5	Icacinaceae	*Stemonorus cf. scorpiodes*	Tabaras akar tinggi	5.54
6	Anacardiaceae	*Campnosperma coriaceum*	Terantang	4.56
7	Sapotaceae	*Palaquium cochlearifolium*	Nyatoh Gagas	4.05
8	Gnetaceae	*Gnetum sp. 1*	Bajakah Luaa	3.90
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10	Moraceae	*Ficus sp.*	Lunuk Bunyer	3.27
11	Sapotaceae	*Palaquium pseudorostratum*	Nyatoh Babi	3.15
12	Sapotaceae	*Madhuca mottleyana*	Katiau	3.06
13	Annonaceae	*Mezzettia umbellata*	Pisang Pisang (Kembalitan hutan)	2.66
14	Tetrimeristaceae	*Tetramerista glabra*	Pornak	2.65
15	Apocynaceae	*Dyera lowii*	Jelutong	2.36
16	Sapindaceae	*Nephellium lappaceum*	Rambutan Hutan	2.22
17	Sapotaceae	*Palaquium cf. xanthochymum*	Nyatoh burung	2.10
18	Euphorbiaceae	*Blumeodendron kurzii*	Kenari	1.81
19	Moraceae	*Ficus sp.*	Lunuk Sambon	1.57
20	Apocynaceae	*Alyxia*	Bajakah Kelanis	1.50
21	Meliaceae	*Sandoricum beccanarium*	Papong	1.45
22	Anacardiaceae	*Campnosperma squamatum*	Nyating	1.28
23	Clusiaceae	*Callophyllum hosei*	Bintangor/jinjit/mentangor	1.19

24	Tiliaceae	*Microcos sp. 1*	Brania Himba	1.17
25	Myrtaceae	*Syzygium havilandii*	Tatumbu	1.16
26	Lauraceae	*Litsea sp. 1*	Medang	0.96
27	Unknown	Unknown epiphyte	Epiphyte	0.76
28	Elaeocarpaceae	*Elaeocarpus mastersii*	Mangkinang	0.75
29	Clusiaceae	*Garcinia bancana*	Manggis	0.74
30	Polygalaceae	*Xanthophyllum cf. ellipticum*	Kemuning	0.64
31	Myrtaceae	*Syzigium sp. 15*	Hampuak Galaget	0.57
32	Moraceae	*Ficus sp.*	Lunuk Tingang	0.53
33	Euphorbiaceae	*Neoschortechinia kingii*	Pupu Palanduk	0.45
34	Sapindaceae	*Xerospermum laevigatum / noronhianum*	Kelumun Biasa	0.37
35	Ebenaceae	*Diospyros evena*	Gulung Haduk	0.36
36	Annonaceae	*Polyalthia hypoleuca*	Alulup (Rewoi)	0.33
37	Clusiaceae	*Callophyllum sclerophyllum*	Kapurnaga	0.32
38	Asclepiadaceae	*Dischidia sp. 2*	Bajakah Tapuser	0.30
39	Menispermaceae	*Fibraurea tinctoria*	Liana Kuning	0.30
40	Myristicaeae	*Horsfieldia crassifolia*	Mendarahan	0.28
41	Crypteroniaceae	*Dactylocladus stenostachys*	Mertibu	0.28
42	Meliaceae	*Aglaia rubiginosa*	Kajalaki	0.27
43	Myrtaceae	*Syzygium sp. 5*	Kayu Lalas Daun Kecil	0.24
44	Clusiaceae	*Calophyllum soulattri*	Takal	0.23
45	Moraceae	*Ficus sp.*	Lunuk	0.19
46	Sapotaceae	*Pouteria sp. 1*	Nyatoh Palanduk	0.19
47	Apocynaceae	*Willughbeia sp. 1*	Bajakah dango	0.19
48	Gnetaceae	*Gnetum sp. 2*	No local name	0.18
49	Clusiaceae	*Garcinia sp 11*	Mahalilis	0.18
50	Myrtaceae	*Syzygium cf. valevenosum*	Kayu Lalas Daun Besar	0.15
51	Fabaceae	*Koompassia malaccensis*	Kempas	0.15
52	Melastomataceae	*Memecylon sp. 3*	Tabati himba	0.15
53	Clusiaceae	*Garcinia cf. parvifolia*	Gandis	0.10
54	Annonaceae	*Xylopia fusca*	Jangkang Kuning (rahanjang)	0.10

55	Aquifoliaceae	*Ilex hypoglauca*	Sumpung	0.10
56	Chrysobalanaceae	*Licania splendens*	Bintan	0.09
57	Sapotaceae	*Palaquium leiocarpum*	Hangkang	0.08
58	Fabaceae	*Dialium sp. 1*	Kala Pimping Napu	0.08
59	Linaceae	*Ctenolophon parvifolius*	Kayu Cahang	0.06
60	Melastomataceae	*Pternandra cf. coerulescens / galeata*	Bengaris (kampas)	0.05
61	Annonaceae	*Cyathocalyx sp. 1*	Karandau	0.04
62	Rhamnaceae	*Zyzyphus angustifolius*	Bajakah Karinat	0.04
63	Myrtaceae	*Syzygium sp. 14*	Milas	0.02
64	Myrtaceae	*Syzygium sp. 13*	Tampohot Himba	0.02
65	Sapindaceae	*Nephellium maingayi*	Kelumun Buhis	0.02

Important Tree Species for Orang-utans in the Sebangau Peat Swamp Forest

Report for the Indonesian Department of Forestry (PHKA)

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The Sebangau peat swamp forest, Central Kalimantan is home to the largest remaining contiguous orang-utan population in the world, numbering >6,900 individuals (Morrogh-Bernard et al., 2003; Husson et al., submitted). Hence, this area is clearly vital for global conservation of this species. Orang-utan diet in the Sebangau is consistent with other published data, with fruit and flowers forming the bulk of foods eaten. Data presented here are based on 24 months of follow data (September 2003 – August 2005), and equals 5,502 follow hours. Over 289 species of plant have been identified to species level in collaboration with the CIMTROP (Centre for the International Cooperation in Management of Tropical Peatlands) Herbarium, of which 153 have been identified as orang-utan foods.

Orang-utans were followed from nest to nest, and the name of food species eaten and length of time these species were fed on were recorded following standardised methods (Morrogh-Bernard et al., 2002). In order to identify which tree species were important to orang-utans, all feeding data was weighted by follow effort/month, in order to reduce any bias in seasonality (Table 1). In order to identify which species were important at specific times of year, the three most important species eaten in any one month were identified (Table 2).

Of the 153 species of plant identified as orang-utan food, 137 were trees, figs or woody lianas. Seventy percent of all feeding time was on just twenty species. These 20 species are listed in rank order of importance (Table 1), and are from the plant families Annonaceae, Apocynaceae, Clusiaceae, Ebenaceae, Euphorbiaceae, Fagaceae, Linaceae, Moraceae, Myrtaceae, Tetrimeristaceae and Sapotaceae. Some of these families, eg. Annonaceae, contain species which have an asynchronous fruiting cycle, i.e. the trees do not all fruit at the same time, thus providing food for orang-utans nearly all year round. They are therefore extremely important for orang-utans during the low fruiting months.

Table 1. Top 20 species eaten by orang-utans ranked by percentage of time feeding.

Ranking	Family	Latin Name	Local name	Percent of total feeding time, weighted by follow effort / month
1	Annonaceae	*Mezzettia leptopoda / parviflora*	Pisang Pisang (Keripak)	8.52%
2	Sapotaceae	*Madhuca mottleyana*	Katiau	6.94%
3	Ebenaceae	*Diospyros bantamensis*	Malam Malam (Aring Pahe)	6.79%
4	Apocynaceae	*Dyera lowii*	Jelutong	5.52%
5	Annonaceae	*Polyalthia hypoleuca*	Alulup (Rewoi)	4.98%
6	Ebenaceae	*Diospyros siamang*	Ehang	4.35%
7	Euphorbiaceae	*Blumeodendron elateriospermum / kurzii*	Kenari	3.84%
8	Clusiaceae	*Garcinia bancana*	Manggis	3.47%
9	Sapotaceae	*Palaquium ridleyii / xanthochymum*	Nyatoh Burung	3.28%
10	Tetrimeristaceae	*Tetramerista glabra*	Pornak	2.89%
11	Annonaceae	*Mezzettia umbellate*	Pisang Pisang	2.25%

			(Kambalitan Hitam)	
12	Annonaceae	*Xylopia fusca*	Jangkang (Rahanjang)	2.10%
13	Linaceae	*Ctenolophon parvifolius*	Kayu Cahang	2.06%
14	Moraceae	*Parartocarpus venenosus*	Lilin Lilin (Tapakan)	2.05%
15	Clusiaceae	*Callophyllum hosei*	Bintangor	2.02%
16	Apocynaceae	*Willughbei*a sp. 1	Bajakah Dango	1.93%
17	Moraceae	*Ficus* spp.	Lunuk-lunukan	1.86%
18	Fagaceae	*Lithocarpus cf. dasystachys*	Pampaning Bayang	1.80%
19	Sapotaceae	*Palaquium cochlearifolium*	Nyatoh Gagas	1.63%
20	Myrtaceae	*Syzygium havilandii*	Tatumbu	1.60%

These twenty species are thus very important components of orang-utan diet. Additionally, there are species which do not form a large part of orang-utan diet overall, but are important at certain times of year. To identify these we recorded the three most-eaten species in each of the 24 months of this study (Table 2). These species include most, but not all, of those in Table 1, and nine additional species, including *Syzygium garcinifolia*, *Sandoricum beccanarium* and *Callophyllum sclerophyllum*. These species are either favoured when they come into season, or important fall-back foods when more preferred species are not in fruit. *Mezzettia leptopoda*, *Diospyros bantamensis*, and *D. siamang* were in the top three species for six of the 24 months, and are therefore extremely important foods for orang-utans in Sebangau.

Table 2 – Seasonally important species.* Species not in top 20 are highlighted in yellow.

Family	**Species**	**Local name**	**Overall ranking**	**Number of months (out of 24) in top three**
Annonaceae	*Mezzettia leptopoda / parviflora*	Pisang Pisang (Keripak)	1	6
Ebenaceae	*Diospyros bantamensis*	Malam Malam (Aring Pahe)	3	6
Ebenaceae	*Diospyros siamang*	Ehang	6	6
Sapotaceae	*Madhuca mottleyana*	Katiau	2	4
Apocynaceae	*Dyera lowii*	Jelutong	4	4
Annonaceae	*Polyalthia hypoleuca*	Alulup (Rewoi)	5	4
Euphorbiaceae	*Blumeodendron elateriospermum / kurzii*	Kenari	7	4
Clusiaceae	*Garcinia bancana*	Manggis	8	4
Sapotaceae	*Palaquium ridleyii / xanthochymum*	Nyatoh Burung	9	4
Annonaceae	*Mezzettia umbellate*	Pisang Pisang (Kambalitan Hitam)	11	4
Tetrimeristaceae	*Tetramerista glabra*	Pornak	10	3
Annonaceae	*Xylopia fusca*	Jangkang (Rahanjang)	12	3
Linaceae	*Ctenolophon parvifolius*	Kayu Cahang	13	2
Moraceae	*Parartocarpus venenosus*	Lilin Lilin (Tapakan)	14	2
Apocynaceae	*Willughbeia* sp. 1	Bajakah Dango	16	2
Fagaceae	*Lithocarpus cf. dasystachys*	Pampaning Bayang	18	2
Myrtaceae	*Syzygium havilandii*	Tatumbu	20	2
Clusiaceae	*Callophyllum*	Bintangor	15	1

	hosei			
Annonaceae	*Artobotrys suaveolins*	Bajakah Balayan	21	1
Gnetaceae	*Gnetum* sp. 1	Bajakah Luaa	22	1
Myrtaceae	*Syzygium garcinfolia*	Jambu Burung	24	1
Rhamnaceae	*Zyzyphus angustifolius*	Karinat	27	1
Myrtaceae	*Syzigium* sp. 15	Hampuak Galaget	28	1
Annonaceae	*Artobotrys cf. roseus*	Bajakah Kalalawit Hitam	32	1
Meliaceae	*Sandoricum beccanarium*	Papong	34	1
Clusiaceae	*Callophyllum sclerophyllum*	Kapurnaga	36	1
Fagaceae	*Lithocarpus* sp. 4	Pampaning Suling	37	1

* Based on data collected between August 2005 and 2006 (which have yet to be analysed fully), *Mesua* sp. 1 would also seem to be a seasonally important species for orang-utans, having appeared in the top three foods for 2 months during this period.

Some of the food species listed here as important orang-utan foods differ from the species reported by Cheyne and Shinta (2006) as being important for gibbons in Sebangau. This difference is partly true, but is also due to the larger data set for orang-utans and different study periods. Simultaneous data currently being collected in Sebangau will allow more concrete conclusions on the differences and similarities between the two species to be drawn. These data will be presented in a second report to be submitted towards the end of next year. Until this time, we advise that those species reported by Cheyne and Shinta (2006) as important gibbon foods should also be considered as important orang-utan foods.

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Appendix A

Following is a complete list of all identified floral species eaten by orang-utans in Sebangau (listed alphabetically). Also included here are additional data collected from September 2005 – August 2006, which have yet to be analysed fully for percentage feeding time. Local names vary widely with location: where possible we have used local names for the Sebangau area, but some local names may be from different areas, as not all species encountered could be given a local Sebangau name. Many species had no known local name, even though Latin names were confirmed.

Family	Genus	Species	Type	Local Name
Anacardiaceae	*Buchanania*	*cf. arborescens*	Tree	Kenyem Burung
Anacardiaceae	*Campnosperma*	*coriaceum*	Tree	Terontang
Anacardiaceae	*Campnosperma*	*squamatum*	Tree	Nyating
Anisophyllaceae	*Combretocarpus*	*rotundatus*	Tree	Tumih
Annonaceae	*Artobotrys*	*cf. roseus*	Liana	Kalalawit Hitam
Annonaceae	*Artobotrys*	*suaveolins*	Liana	Bajakah Balayan
Annonaceae	*Cyathocalyx*	*biovulatus*	Tree	Kerandau
Annonaceae	*Fissistigma*	sp. 1	Liana	No local name
Annonaceae	*Mezzetia*	*leptopoda / parviflora*	Tree	Keripak
Annonaceae	*Mezzetia*	*umbellata*	Tree	Kambalitan Hitam
Annonaceae	*Polyalthia*	*glauca*	Tree	Kayu Bulan
Annonaceae	*Polyalthia*	*hypoleuca*	Tree	Rewoi
Annonaceae	*Xylopia*	*coriifolia*	Tree	Nonang
Annonaceae	*Xylopia*	*fusca*	Tree	Rahanjang
Annonaceae	*Xylopia*	*cf. malayana*	Tree	Tagula
Apocynaceae	*Alyxia*	sp. 1	Liana	Kelanis
Apocynaceae	*Dyera*	*lowii*	Tree	Jelutong
Apocynaceae	*Willughbeia*	sp. 1	Liana	Bajakah

				Dango
Aquifoliaceae	*Ilex*	*hypoglauca*	Tree	Sumpung
Araceae	*Raphidophora*	sp. 1	Liana	No local name
Araliaceae	*Schleffera*	sp. 1	Tree	No local name
Araliaceae	*Schleffera*	sp. 2	Liana	Bajakah Sapahurung
Arecaceae (*Palmae*)	*Calamus*	sp. 1	Climber	Uey Liling
Asclepiadaraceae	*Astrostemma*	*spartioides*	Epiphyte	Anggrek Rangau
Asclepiadaraceae	*Dischidia*	*cf. latifolia*	Epiphyte	No local name
Asclepiadaraceae	*Dischidia*	sp. 1	Epiphyte	No local name
Asclepiadaraceae	*Dischidia*	sp. 2	Epiphyte	Bajakah Tapuser
Asclepiadaraceae	*Hoya*	sp. 1	Epiphyte	No local name
Burseraceae	*Santiria*	*cf. griffithi*	Tree	Teras Bamban
Burseraceae	*Santiria*	sp. 1	Tree	Gerrongang Putih
Chrysobalanaceae	*Licania*	*splendens*	Tree	Bintan
Clusiaceae (*Guttiferae*)	*Calophyllum*	*cf. fragrans*	Tree	Kapurnaga Kalakei
Clusiaceae (*Guttiferae*)	*Calophyllum*	*hosei*	Tree	Jinjit
Clusiaceae (*Guttiferae*)	*Calophyllum*	*cf. lanigerum*	Tree	Mahadingan
Clusiaceae (*Guttiferae*)	*Calophyllum*	*sclerophyllum*	Tree	Kapurnaga
Clusiaceae (*Guttiferae*)	*Calophyllum*	*soulattri*	Tree	Takal
Clusiaceae (*Guttiferae*)	*Calophyllum*	sp. 1	Tree	Mahadingan
Clusiaceae (*Guttiferae*)	*Calophyllum*	sp. 2	Tree	Kapurnaga Kalakei
Clusiaceae (*Guttiferae*)	*Calophyllum*	sp. 3	Tree	Kapurnaga Kalakei
Clusiaceae (*Guttiferae*)	*Calophyllum*	sp. 4	Tree	Kapurnaga Kalakei
Clusiaceae (*Guttiferae*)	*Garcinia*	*bancana*	Tree	Manggis
Clusiaceae (*Guttiferae*)	*Garcinia*	*cf. parvifolia*	Tree	Gandis
Clusiaceae (*Guttiferae*)	*Garcinia*	sp. 1	Tree	No local name
Clusiaceae (*Guttiferae*)	*Garcinia*	sp. 2	Tree	Mahalilis
Clusiaceae (*Guttiferae*)	*Garcinia*	sp. 3	Tree	Gantalan
Clusiaceae (*Guttiferae*)	*Garcinia*	sp. 4	Tree	Manggis Hutan
Clusiaceae (*Guttiferae*)	*Mesua*	sp. 1	Tree	Tabaras Akar Tinggi
Crypteroniaceae	*Dactylocladus*	*stenostachys*	Tree	Mertibu
Dipterocarpaceae	*Shorea*	*teysmanniana*	Tree	Meranti Bitik
Ebenaceae	*Diospyros*	*bantamensis*	Tree	Aring Pahe
Ebenaceae	*Diospyros*	*confertiflora*	Tree	Arang
Ebenaceae	*Diospyros*	*cf. evena*	Tree	Gulung Haduk

Ebenaceae	*Diospyros*	*lanceifolia*	Tree	Arang
Ebenaceae	*Diospyros*	*siamang*	Tree	Ehang
Elaeocarpaceae	*Elaeocarpus*	*acmocarpus*	Tree	Patanak
Elaeocarpaceae	*Elaeocarpus*	*cf. griffithi*	Tree	Rarumpuit
Elaeocarpaceae	*Elaeocarpus*	*mastersii*	Tree	Mangkinang
Euphorbiaceae	*Antidesma*	*coriaceum*	Tree	Dawat
Euphorbiaceae	*Antidesma*	*phanerophleum*	Tree	Tanundang
Euphorbiaceae	*Blumeodendron*	*elateriospermum / tokbrai*	Tree	Kenari
Euphorbiaceae	*Neoscortechinia*	*kingii*	Tree	Pupu Palanduk
Euphorbiaceae	Sp. 1		Liana	No local name
Fabaceae (*Leguminosae*)	*Adenanthera*	*pavonina*	Tree	Tapanggang
Fabaceae (*Leguminosae*)	*Dalbergia*	sp. 1	Liana	No local name
Fabaceae (*Leguminosae*)	*Dialium*	*patens*	Tree	Kala Pimping Napu
Fabaceae (*Leguminosae*)	*Koompassia*	*malaccensis*	Tree	Bungaris
Fabaceae (*Leguminosae*)	*Leucomphalos*	*callicarpus*	Liana	Akar Kamunda
Fabaceae (*Leguminosae*)	*Ormosia*	sp. 1	Tree	No local name
Fagaceae	*Castanopsis*	*foxworthyii / jaherii*	Tree	Takurak
Fagaceae	*Lithocarpus*	*conocarpus*	Tree	Pampaning Bayang
Fagaceae	*Lithocarpus*	*cf. dasystachys*	Tree	Pampaning Bitik
Fagaceae	*Lithocarpus*	sp. 1	Tree	Pampaning Suling
Gesneraceae	Sp. 1		Liana	No local name
Gnetaceae	*Gnetum*	sp. 1	Liana	Bajakah Luaa
Gnetaceae	*Gnetum*	sp. 2	Liana	No local name
Hypericaceae	*Cratoxylon*	*glaucum*	Tree	Geronggang
Icacinaceae	*Stemonorus*	*cf. scorpiodes*	Tree	Tabaras
Lauraceae	*Litsea*	*cf. elliptica*	Tree	Medang
Lauraceae	*Litsea*	*cf. resinosa*	Tree	Medang
Lauraceae	*Litsea*	*cf. rufo-fusca*	Tree	Tampang
Lauraceae	*Phoebe*	*cf. grandis*	Tree	Tabitik
Linaceae	*Ctenolophon*	*parvifolius*	Tree	Kayu Cahang
Loganiaceae	*Fragraea*	sp. 1	Liana	Kalamuhe
Loranthaceae	*Dendrophtoe*	*incurvata*	Parasite	No local name
Loranthaceae	*Lepidaria*	sp. 1	Parasite	Mentawa
Magnoliaceae	*Magnolia*	*bintulensis*	Tree	Asam Asam
Melastomataceae	*Memecylon*	sp. 3	Tree	Tabati Himba
Melastomataceae	*Pternandra*	*cf. coerulescens / galeata*	Tree	Kemuning yg bergaris tiga
Meliaceae	*Aglaia*	sp. 1	Tree	Bangkuang Napu
Meliaceae	*Sandoricum*	*beccanarium*	Tree	Papong
Menispermaceae	*Fibraurea*	*tinctoria*	Liana	Kalamuhe
Moraceae	*Ficus*	*cf. spathulifolia*	Fig	Lunuk Punai
Moraceae	*Ficus*	*cf. stupenda*	Fig	Lunuk Tingang
Moraceae	*Ficus*	sp. 1	Fig	Lunuk Bunyer
Moraceae	*Ficus*	sp. 2	Fig	Lunuk Buhis

Moraceae	*Ficus*	sp. 3	Fig	Lunuk Sambon
Moraceae	*Ficus*	sp. 4	Fig	Lunuk
Moraceae	*Parartocarpus*	*venenosus*	Tree	Tapakan
Myristicaceae	*Gymnacranthera*	*farquhariania*	Tree	Mendarahan
Myristicaceae	*Horsfieldia*	*crassifolia*	Tree	Mendarahan
Myristicaceae	*Myristica*	*lowiana*	Tree	Mahadarah hitam
Myrsinaceae	*Ardisia*	*cf. sanguinolenta*	Tree	Kalanduyung himba
Myrsinaceae	*Ardisia*	sp. 2	Tree	Kamba Sulan
Myrsinaceae	*cf. Rapanea*	*borneensis*	Tree	Mertibu
Myrtaceae	*Syzygium*	*havilandii*	Tree	Tatumbu
Myrtaceae	*Syzygium*	*cf. garcinifolia*	Tree	Jambu Burung
Myrtaceae	*Syzygium*	*cf. valevenosum*	Tree	Kayu Lalas
Myrtaceae	*Syzygium*	*cf. E.spicata*	Tree	Kayu Lalas
Myrtaceae	*Syzygium*	sp. 1	Tree	Tampohot Himba
Myrtaceae	*Syzygium*	sp. 2	Tree	Milas
Myrtaceae	*Syzygium*	sp. 3	Tree	Hampuak Galaget
Myrtaceae	*Syzygium*	sp. 4	Tree	Kemuning Putih
Myrtaceae	*Tristaniopsis*	*cf. merguensis*	Tree	Blawan Putih
Ochnaceae	Sp. 1		Tree	No local name
Oleaceae	*Chionanthus*	sp. 1	Tree	No local name
Orchidaceae	*Eria*	sp. 1	Epiphyte	Anggrek Bawang
Pandanaceae	*Freycinetia*	sp. 1	Climber	Akar Gerising
Pandanaceae	*Freycinetia*	sp. 2	Climber	Katipei Pari
Pandanaceae	*Pandanus*	sp. 1	Shrub	Sambalaun
Pandanaceae	*Pandanus*	sp. 2	Shrub	Rasau
Pittosporaceae	*Pittosporum*	sp. 1	Tree	Prupuk Tulang
Polygalaceae	*Xanthophyllum*	*cf. ellipticum*	Tree	Pohon Kemuning
Rhamnaceae	*Zyzyphus*	*angustifolius*	Liana	Karinat
Rubiaceae	*Canthium*	*dydimum*	Tree	Kopi Kopi
Rubiaceae	*Ixora*	*havilandii*	Tree	Keranji
Rubiaceae	Sp. 1		Liana	No local name
Rubiaceae	*Uncaria*	sp. 1	Liana	Kalalawit Bahandang
Rutaceae	*Tetractomia*	*tetrandra*	Tree	Rambangun
Sapindaceae	*Nephellium*	*lappaceum*	Tree	Manamun
Sapindaceae	*Nephellium*	*maingayi*	Tree	Kelumun Buhis
Sapindaceae	*Xerospermum*	*laevigatum / noronhianum*	Tree	Kelumun Bakei
Sapotaceae	*Isonandra*	*lanceolata*	Tree	Nyatoh Palanduk
Sapotaceae	*Isonandra*	sp. 1	Tree	Nyatoh Palanduk
Sapotaceae	*Madhuca*	*mottleyana*	Tree	Katiau
Sapotaceae	*Palaquium*	*cochlearifolium*	Tree	Nyatoh Gagas
Sapotaceae	*Palaquium*	*leiocarpum*	Tree	Hangkang
Sapotaceae	*Palaquium*	*pseudorostratum*	Tree	Nyatoh Bawoi
Sapotaceae	*Palaquium*	*ridleyii*	Tree	Nyatoh Burung
Sapotaceae	*Palaquium*	*cf. xanthochymum*	Tree	Nyatoh Burung

Sapotaceae	*Palaquium*	sp. 1	Tree	Nyatoh Burung
Sapotaceae	*Palaquium*	sp. 2	Tree	Nyatoh Burung
Simaroubaceae	*Quassia*	*borneensis*	Tree	Kayu Takang
Smilacaceae	*Smilax*	sp. 1	Liana	Bajakah Tolosong
Sterculiaceae	*Sterculia*	*rhoiidifolia*	Tree	Loting
Tetrameristaceae	*Tetramerista*	*glabra*	Tree	Ponak
Theaceae	*Ternstroemia*	*magnifica*	Tree	Tabunter
Tiliaceae	*Microcos (Grewia)*	sp. 1	Tree	Brania himba
Verbenaceae	*Clerodendron*	sp. 1	Tree	Sopang
Vitaceae	*Ampelocissus*	*rubiginosa*	Liana	Bajakah Panamar Pari
Vitaceae	*Ampelocissus*	sp. 1	Liana	Bajakah Oyang
Zingiberaceae	*Zingiber*	sp. 1	Shrub	Suli Tulang
Unknown			Epiphyte	Anggrek tanduk rusa
Unknown			Epiphyte	Pahakung

Photo 1: Dr Susan Cheyne following Gibbon Group Karate

Photo 2: Dr Susan Cheyne, research assistant Claire Thompson and volunteers surveying gibbons

Photo 3: Dr Susan Cheyne and Mark Harrison processing ape food samples

Photo 4: Dr Susan Cheyne surveying the forest after a devastating fire near camp

Photo 5: Dr Susan Cheyne following Gibbon Group C

ACCOUNTING

Received Indonesian Rupiah	80 450 250
OUTGOINGS 2007	
January	19 910 600
February	20 172 250
March	15 925 500
April	13 669 500
May	14 095 400
TOTAL SPENT	83 773 250
REMAINING TO BE SPENT	-3 323 000

Date	Description	Receipt number	Amount	Total Expenditure
03-janv-07	Scalpel blades	3247	25 000	25 000-
04-janv-07	Batteries	3248	145 800	170 800-
04-janv-07	Stationary	3249	3 300	174 100-
05-janv-07	Field boots for Dewa	3252	42 500	216 600-
05-janv-07	Washing powder for camp	3250	88 750	305 350-
09-janv-07	Data folders	3255	24 000	329 350-
09-janv-07	Ponchos for field	3253	120 000	449 350-
09-janv-07	Torch for Dewa	3254	20 000	469 350-
10-janv-07	Internet and printing	3258	56 500	525 850-
10-janv-07	Kerosene for oven	3256	100 000	625 850-
10-janv-07	Two-way radio battery	3257	150 000	775 850-
14-janv-07	Folder for gibbon follows	3234	11 500	787 350-
14-janv-07	Bandages and wound dressings	3261	45 000	832 350-
14-janv-07	New SIM and pulsa for Mark	3260	112 000	944 350-
15-janv-07	Duplicate lab keys	3262	18 000	962 350-
15-janv-07	Two-way radio antenna	3264	80 000	1 042 350-
22-janv-07	Susan pulsa	3272	100 000	1 142 350-
24-janv-07	Bleach and washing powder for camp	3238	44 450	1 186 800-
24-janv-07	Plastic folders and gaffer tape	3236	15 200	1 202 000-
24-janv-07	Scrubbing brush	3237	2 500	1 204 500-
25-janv-07	Field socks for Twenti	3241	15 000	1 219 500-
29-janv-07	Silica gel	3276	56 000	1 275 500-
29-janv-07	Susan flight JKT-PKY	3275	350 000	1 625 500-
31-janv-07	Ari wages	3242	420 000	2 045 500-
31-janv-07	Cis wages	3243	420 000	2 465 500-
31-janv-07	Camp costs	3283	10 110 000	12 575 500-
31-janv-07	Camp electricity	3284	15 000	12 590 500-
31-janv-07	Dewa wages	3278	1 076 000	13 666 500-
31-janv-07	Iwan parting bonus	3282	1 615 100	15 281 600-
31-janv-07	Iwan wages	3281	795 000	16 076 600-
31-janv-07	Twenti wages	3285	1 121 000	17 197 600-
31-janv-07	Yon wages	3286	775 000	17 972 600-
31-janv-07	Yudhi wages	3279	1 013 000	18 985 600-
Monthly	Bemos	n	292 500	19 278 100-
Monthly	Boats	n	210 000	19 488 100-
Monthly	Food in town	n	380 000	19 868 100-
Monthly	Internet	n	42 500	19 910 600-

Date	Description	Receipt number	Amount	Total Expenditure
29-janv-07	Susan Indonesian visa	lost	500 000	500 000-
01-févr-07	Airport taxi (PKY)	3307	50 000	550 000-
01-févr-07	Departure tax JKT	3306	30 000	580 000-
02-févr-07	Candles (camp) and batteries	3338	139 700	719 700-
02-févr-07	Photocopying	3339	30 000	749 700-
02-févr-07	Mark HP bill (Jan)	3309	210 000	959 700-
03-févr-07	Kerosene for oven	3340	100 000	1 059 700-
04-févr-07	Camp costs corrections (Jan)	3310	335 000	1 394 700-
09-févr-07	Mandi scoop for camp	3343	3 500	1 398 200-
09-févr-07	Watch repairs (Dewa and Twenti)	3341	40 000	1 438 200-
09-févr-07	Airport bus	3288	15 000	1 453 200-
09-févr-07	Hotel	3289	170 000	1 623 200-
10-févr-07	Dewa vitamins (tonikum)	3345	15 700	1 638 900-
10-févr-07	Mark field shirt repairs	3344	5 000	1 643 900-
10-févr-07	Kerosene for oven	3314	100 000	1 743 900-
10-févr-07	Printing	3313	28 000	1 771 900-
10-févr-07	Susan JKT departure tax	3315	30 000	1 801 900-
10-févr-07	Susan police registration	3291	150 000	1 951 900-
10-févr-07	Susan pulsa IM3	3292	54 000	2 005 900-
14-févr-07	Photos for BBC	3346	52 000	2 057 900-
14-févr-07	Batteries	3293	9 350	2 067 250-
14-févr-07	DVD gibbon film	3295	215 000	2 282 250-
14-févr-07	Photocopying	3294	14 000	2 296 250-
15-févr-07	Batteries	3296	31 200	2 327 450-
16-févr-07	New phone for house (old one broke)	3318	47 500	2 374 950-
17-févr-07	Photocopying	3319	35 000	2 409 950-
17-févr-07	Batteries	3298	165 000	2 574 950-
17-févr-07	Susan pulsa	3297	100 000	2 674 950-
18-févr-07	Batteries	3287	132 000	2 806 950-
19-févr-07	Torch and batteries	3299	18 700	2 825 650-
19-févr-07	Wellington boots for staff	3300	110 000	2 935 650-
23-févr-07	Photocopying	3322	10 000	2 945 650-
23-févr-07	Posting Mark PCI contract and LIPI letters	3323	103 000	3 048 650-
23-févr-07	Envelopes	3303	50 500	3 099 150-
23-févr-07	Phone to Oxford	3302	171 600	3 270 750-
24-févr-07	Field clothes for Ambut	3325	380 000	3 650 750-
25-févr-07	Kerosene for oven	3326	100 000	3 750 750-
28-févr-07	Ambut wages	3334	309 000	4 059 750-
28-févr-07	Ari wages	3333	840 000	4 899 750-
28-févr-07	Camp costs	3337	8 975 000	13 874 750-
28-févr-07	CIMTROP Patrol team wages (help with BBC)	3329	320 000	14 194 750-
28-févr-07	Dewa wages	3330	1 025 000	15 219 750-
28-févr-07	Iwan wages (pheno)	3327	240 000	15 459 750-
28-févr-07	Twenti wages	3328	987 000	16 446 750-
28-févr-07	Yon parting bonus	3336	824 000	17 270 750-
28-févr-07	Yon wages	3335	947 000	18 217 750-
28-févr-07	Yudhi wages	3331	428 000	18 645 750-
28-févr-07	Envelopes	3305	15 000	18 660 750-

28-févr-07	Post (CD for Oxford)	3304	151 000	18 811 750-
Monthly	Bemos	n	387 000	19 198 750-
Monthly	Boats	n	410 000	19 608 750-
Monthly	Food in town	n	463 000	20 071 750-
Monthly	Internet café	n	100 500	20 172 250-

Date	Description	Receipt number	Amount	Total
01-mars-07	Fax to LIPI	3354	52 500	52 500
01-mars-07	Making CD orang-utan mating footage	3355	150 000	202 500
01-mars-07	Photocopying	n	2 000	204 500
04-mars-07	Pulsa	3357	100 000	304 500
12-mars-07	Grace visa extension	3350	460 000	764 500
14-mars-07	Nails	3362	20 000	784 500
15-mars-07	Batteries	3366	195 000	979 500
15-mars-07	Fixing Ambut watch	n	20 000	999 500
15-mars-07	Kerosene for oven	3363	100 000	1 099 500
15-mars-07	Photocopying	3364	15 000	1 114 500
15-mars-07	Postage	3368	60 000	1 174 500
15-mars-07	Printing pheno sheets	3370	24 500	1 199 000
15-mars-07	Scalpels and blades	3365	24 000	1 223 000
15-mars-07	Urine syringes and vitamins	3367	18 000	1 241 000
19-mars-07	Import duty (urinalysis sticks)	3371	248 000	1 489 000
25-mars-07	Kerosene for oven	3359	100 000	1 589 000
26-mars-07	Mosquito coil for the forest	3372	115 000	1 704 000
26-mars-07	Photocopying	n	100	1 704 100
26-mars-07	Printing Mark BALITBANGDA report	n	5 000	1 709 100
26-mars-07	Pulsa	3373	100 000	1 809 100
27-mars-07	House cleaner wages	n	100 000	1 909 100
27-mars-07	Milk for camp	3376	39 300	1 948 400
27-mars-07	Photocopying	n	5 600	1 954 000
27-mars-07	Posting Mark LIPI reports (Bogor)	3375	7 500	1 961 500
27-mars-07	Posting Mark LIPI reports (Jakarta)	3374	13 500	1 975 000
30-mars-07	Printing	3352	53 000	2 028 000
31-mars-07	Ambut doctors	n	37 000	2 065 000
31-mars-07	Ambut wages	3381	985 000	3 050 000
31-mars-07	Camp costs	3384	8 387 500	11 437 500
31-mars-07	Camp electricity	3385	15 000	11 452 500
31-mars-07	Dewa wages	3378	628 000	12 080 500
31-mars-07	Santi wages	3383	520 000	12 600 500
31-mars-07	Twenti wages	3380	1 164 000	13 764 500
31-mars-07	Yudhi wages	3377	980 000	14 744 500
Monthly	Bemos	NA	514 500	15 259 000
Monthly	Boats	NA	340 000	15 599 000
Monthly	Food in town	NA	326 500	15 925 500

Date	Description	Receipt number	Amount	Total Expenditure
03-avr-07	Photocopying all gibbon data (2005-07)	3389	266 500	266 500-
08-avr-07	Grip-lock sample bags	3403	17 500	284 000-
09-avr-07	Kerosene for oven	n	100 000	384 000-
09-avr-07	Photcopying	n	1 000	385 000-
09-avr-07	Photocopying data sheets	3405	25 000	410 000-
09-avr-07	Ring binder for data	3407	22 200	432 200-
10-avr-07	Printing (pheno sheets and vol stuff)	3391	96 500	528 700-
10-avr-07	Cellotape and permanent marker	3408	13 700	542 400-
10-avr-07	Photocopying	n	1 700	544 100-
10-avr-07	Sending samples to LIPI lab	3409	64 200	608 300-
11-avr-07	Pulsa for Susan	n	100 000	708 300-
19-avr-07	Lamp for kitchen	3398	20 000	728 300-
19-avr-07	Washing powder for camp	3386	87 000	815 300-
19-avr-07	Photocopying data sheets	3411	10 000	825 300-
19-avr-07	Printing letters	3413	11 500	836 800-
20-avr-07	Headset	3417	50 000	886 800-
20-avr-07	Kerosene for oven	3414	100 000	986 800-
21-avr-07	Medical supplies	n	10 000	996 800-
25-avr-07	Yudhi doctors	n	30 000	1 026 800-
28-avr-07	Torches for assistants	3387	38 000	1 064 800-
30-avr-07	Antibiotics for camp medical kit	3399	84 600	1 149 400-
30-avr-07	Batteries for head torch	3401	8 000	1 157 400-
30-avr-07	Medicine for cook	3400	12 600	1 170 000-
30-avr-07	Ambut wages	3423	987 000	2 157 000-
30-avr-07	Camp costs	3426	7 770 000	9 927 000-
30-avr-07	Dewa wages	3420	972 000	10 899 000-
30-avr-07	Twenti wages	3425	1 101 000	12 000 000-
30-avr-07	Yudhi wages	3424	871 000	12 871 000-
Monthly	Taxis	n	216 500	13 087 500-
Monthly	Boats	n	270 000	13 357 500-
Monthly	Food in town	n	312 000	13 669 500-

Date	Description	Receipt number	Amount	Total Expenditure
04-mai-07	Photocopying	n	1 300	1 300-
04-mai-07	Printing	3439	32 500	33 800-
04-mai-07	Pulsa	3440	100 000	133 800-
04-mai-07	Two-way radio repairs	3438	150 000	283 800-
06-mai-07	Kerosene for oven	3430	100 000	383 800-
12-mai-07	Pulsa	3441	100 000	483 800-
16-mai-07	Batteries	n	117 000	600 800-
16-mai-07	Field rucksacks for assistants	3436	405 000	1 005 800-
16-mai-07	Field socks for assistants	3435	50 000	1 055 800-
23-mai-07	Ambut boots	n	60 000	1 115 800-
23-mai-07	Printing	n	4 000	1 119 800-
24-mai-07	Pens	3442	10 000	1 129 800-
28-mai-07	Kerosene for oven	3447	100 000	1 229 800-
28-mai-07	Photocopying LIPI reports	n	6 500	1 236 300-
28-mai-07	Posting LIPI report (Bogor)	3446	6 000	1 242 300-
28-mai-07	Posting LIPI report (Jakarta)	3445	17 600	1 259 900-
28-mai-07	Pulsa	3457	100 000	1 359 900-
31-mai-07	Ambut wages	3452	1 187 000	2 546 900-
31-mai-07	Camp accomodation and food	3456	7 100 000	9 646 900-
31-mai-07	Camp electricity	3455	35 000	9 681 900-
31-mai-07	Dewa wages	3451	1 116 000	10 797 900-
31-mai-07	Twenti wages	3453	1 169 000	11 966 900-
31-mai-07	Yudhi wages	3454	1 015 000	12 981 900-
Monthly	Taxis	n	304 500	13 286 400-
Monthly	Boats	n	210 000	13 496 400-
Monthly	Food in town	n	540 000	14 036 400-
Monthly	Internet	n	59 000	14 095 400-