FINAL REPORT TO BIODIVERSITY RESEARCH AND TRAINING PROGRAM/BIOTEC, NSTDA (January, 2006)

บทบาทของชะนีในการฟื้นตัวของป่าในแปลงศึกษาความหลากหลายทางชีวภาพ มอสิงโต อุทยานแห่งชาติเขาใหญ่

The Role of Gibbons in Forest Regeneration on the Mo Singto Long Term Research Plot, Khao Yai National Park

(BRT R_346005)

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(English) **The Role of Gibbons in Forest Regeneration on the Mo Singto Long Term Research Plot, Khao Yai National Park (BRT R_346005)**

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Total Period of Project:

May 2003 – April 2005 (2 years)

Objectives of Project

1. Carry out a detailed analysis of gibbon ranging behaviour and tree use on the Mo Singto Plot.

2. Study the effect of gibbon ranging patterns on seed dispersal, and on seed germination.

3. Analyze the distribution of young stages (< 10 cm) of fruit trees and lianas on the plot in relation to environmental factors.

4. Understand the recruitment of fruiting species used by gibbons, as affected by fruit harvest, seed-fall, environmental factors, and tree density.

Results and Achievements

(This section approximately follows the "Project Activities" of section 4.2 of the original proposal)

1. Plot databases

The **main plot database** for theMo Singto Plot, written in MS Access, is basically complete, and input of plot data is continuing. The database contains tables for tree censuses, quadrat environmental factors, and species of plants. The tables for tree censuses contain information on tree species, family, x and y coordinates, quadrat number, dbh (diameter), and tree status and condition. The quadrat table contains information for each 20x20 m quadrat including elevation, slope, slope direction, and cover by the herb *Strobilanthes*.The species table contains data on numbers of stems, uses and feeding by animals. Manpower for inputting of data has not been sufficient so that the project is behind in inputting data on quadrats and species. A supplementary project for increasing support for the Mo Singto project has been funded by Mahidol University, which includes funding for one data inputter and one additional field assistant to help with the research of Chanpen Wongsiriphuak.

The second census data, including trees down to 1 cm in dbh, have been input into a new table, which includes around 150,000 tree and shrub stems. This database is nearly complete and lacks only identifications which are still being input by assistant Mr. Amnart Bunkongchart. It will be completely input early in 2006.

Liana database.—Digitized photos of all liana stems, about 150 species, are kept in the computer of the PI and these will be used to produce a key to the stem and other vegetative characters of all species in the Mo Singto area. Ten characters to be used in the key have already been measured, but the key has not yet been constructed, as this is a relatively low priority activity.

Herbarium database.—An additional part of the database is the list of herbarium holdings from Khao Yai Park and other areas in which BIOTEC Ecology Lab projects

are being carried out. This list is organized by family and genus, and contains specimen collection numbers, dates, type of material on the herbarium sheet, life form, plot tree id. number (if relevant) and number of duplicates.

Gibbon foraging database.—The 3rd major database consists of gibbon foraging data, collected during 6 days each month by 2 to 4 research assistants follow the adults of group A on the plot from dawn to sleeping time each day. The adults are followed all around the plot, and the number of each tree entered is recorded (from the id on the aluminum tree tag), along with the behavior of the gibbon in the tree and the type of food eaten, if any. All feces defecated during the day is also collected by one person, and is bagged, labeled and sieved back in the lab to remove all plant seeds swallowed. These are identified with the help of the reference seed collection. The foraging data are stored in MS Excel files, which can be joined with the tree census files so that the tree names and *x-y* plot coordinates can be input to the foraging file. After an error-correcting procedure, the data are imported into ArcView so that tree-to-tree foraging paths can be plotted on maps. Food trees, defecation trees, etc. can be plotted on the map in order to display feeding behavior, seed dispersal, or the spatial distribution of various behaviors such as singing, sleeping, or territorial defense.

Field data collection hand device.—A software program for the Palm hand-held computer was constructed by the Information Systems Laboratory at BIOTEC, for the purpose of digitizing tree census data in the forest at time of collection. It was developed on a special project funded by BIOTEC/NSTDA. A computer engineering graduate from Kasetsart University, Mr. Eak-kasit Patcharawongsakda, was hired to carry out this project under the supervision of Dr. Suphavadee Ingsriswang of the Information Systems Laboratory of the Central Research Unit, BIOTEC. The census data are being input into Palm computers from field data, but field workers find that recording initially on paper forms is speedier, and they prefer to use written notes. A module for downloading into the regular Access database has also been completed. The major problem with the Palm is that the screen is too small, being only about 300 pixels wide. The screen needs to be at least about 600 pixels wide and high, in order to be able to easily input mapping data for a 5-m wide subquadrat to a precision of 1 cm. Another problem is that the keyboard of the Palm is too small, leading to difficulties and errors in punching keys. In the future, a new, slightly larger, hand-held device must be found for inputting data.

2. Recensus of trees on plot

The tree census of all stems down to 1 cm in diameter is now complete, but identification of the trees is not quite complete. It is expected that the data will be all input by early 2006. The new census adds about 150,000 more trees and shrubs to the database, and beings the number of species up to about 240.

3. Environmental variation over the plot

The environmental variables (including mean elevation, slope, slope direction, terrain contour (flat, convex, concave, etc.), cover of the weed *Strobilanthes*, percentage of area in gaps, light, soil characters, etc.) have been collected but have not been completely input into the database. The file has been created and will be filled soon. Light and soil variables also have not been collected for all quadrats but have been collected for selected areas, such as in the secondary forest, and in gaps.

4. Gibbon ranging paths and tree use

The adults of gibbon group A were followed for 5 or 6 days per month from dawn until they entered the sleeping tree in the afternoon. During each follow, several hundred tree numbers are typically recorded by the observers, one of which checks the trees that the gibbons enter and one of which records the spoken numbers in a notebook. If four field assistants or students were available, both adults were followed, but if only two were available, only the female Andromeda was followed. The data are accumulated in Excel files, including tree numbers, behaviors, foods eaten and seeds recovered from feces. These data have been summarized in tables, but are still not completely analyzed. An example of a gibbon ranging file is shown in Table 1, which shows the female records of entering 341 trees. Sometimes the number of trees entered exceeded 500.

As would be expected, a few mistakes are occasionally made in every follow.

Method of error correction.—The method of checking for errors involves checking the quadrat numbrs in the foraging path files collected in the field with the quadrat numbers in the tree census data files. The tree number is the key variable which allows us to join the files together into a single table. The quadrat number appears in both files, so that if that number differs for any of the trees, there is a mistake: either the tree number or the quadrat number was entered wrong. This method of error correction, however, will not detect errors in trees if the wrong number represents a tree in the same quadrat as the right one. In such a case the error in foraging path will be rather small. In the case of a food tree, however, the error will be caught because the species of food trees are recorded in the foraging data file, which can be compared with the tree species in the tree census file. When errors are detected, they are listed in a special print-out which is sent back to the field team for inspection. Usually they can inspect the quadrat maps and figure out what the correct tree or quadrat was supposed to be. So far, errors have been corrected for only the 6-month period of July – December, 2003, the season in which *Choerospondias* trees were censused for fruiting activity.

For the 2003 data, we have summarized (1) number of trees used per day by Andromeda, (2) number of active hours per day, (3) foraging path length (for July). Figure 1 shows all the trees on the plot over 10 cm in diameter from the first census, on which the foraging path data are based.

Foraging travel paths.— Table 2 shows a summary of the ranging path data for the year 2003. The actual travel distances in meters have been calculated from GIS files only for July–December. The number of trees entered and total daily range varies with season, being longest during the main fruiting season in March to October, and is lowest during November through February.

Foraging paths are printed our using Arcview after importing the files to the GIS database. A sample ranging path is shown in Figure 2. The analysis of ranging paths has just begun, and will eventually include the following:

- Number of trees visited per day for each kind of activity
- Length of ranging path calculated from inter-tree distances, and its changes with season
- Number of tree fruits, vine fruits, and leaf food sources visited per month
- Correlation between diet and foraging path length
- Fruit types visited on successive days

- Proportion of fruiting trees of a given species visited during the fruiting season

To determine the last item above it will be necessary to check to see how many trees of each species have fruited each season. This was done for *Choerospondias axillaris* in 2003, and for *Prunus javanica* and *Nephelium melliferum* in 2004 when these trees had a large fruiting. Both of these species virtually failed to fruit during 2005.

Foraging path length increases when the availability of succulent fruits increases in the rainy season, and is lowest during Nov. – Jan. when fruit availability is lowest. When high-energy fruit is less available, the gibbons apparently travel less and save energy. Use of succulent fruits also entails traveling long distances across the home range, and therefore much travel activity is required to reach such trees. Analysis of path length and number of trees used per day is continuing and this year the 2004 data will be analyzed also.

Evidence of knowledge of home range.—One of the main objectives of studying foraging paths and tree use is to try to determine how well the gibbons know the locations of food sources, and how much this knowledge helps to increase the efficiency of foraging. Several types of evidence can be examined for the use of knowledge of the trees, particularly the food sources, in the home range. The four types of evidence are listed below.

(1) *Long daily range path in relation to the size of the range*

The daily range is usually more than 2000 m in the fruiting season and reaches nearly 3000 m, which is around 4 to 6 times of the diameter of the total range of around 500 m (Table 2). This means that the gibbon group can cross its home range several times a day in order to find ripe fruits if necessary, making maximum use of knowledge of trees. It also means that rare food trees can be utilized as well as common ones. One of the rarest species is *Aphananthe cuspidata* (Ulmaceae) which has only 2 large trunks on the plot, and usually only one has ripe fruit at one time. Gibbons visit this tree once or twice a day when ripe, often crossing their range to reach it.

Figure 2 shows the daily range on one day in 2003, October 4. On this day the gibbons travelled 2303 m and entered a total of 332 trees while covering a large proportion of the range and visiting fruit trees.

(2) *The group travels over the same pathways through the trees on different days.*

This is shown clearly by inspecting a map showing the travel paths for 6 successive days, as shown in Figure 3 for the 6 days of following in November of 2003. There are several areas crossed by paths through the same trees. This indicates that the gibbons have favored travel routes through the home range and detailed knowledge of the trees.

(3) *The gibbons move directly toward important fruit trees that are beyond their view.*

Frequently a gibbon group will move more than 100 meters toward a fruiting tree without pausing, indicating that they are not searching for food sources as they move about, but travelling directly toward the food source they already know about. Such directed travel saves time and energy in foraging. In Figure 2, for example, the group moved most of the way from south of the position at 10:04 h southward to a fig tree

without deviating much, arriving at 11:17 h. They moved about 300 m without engaging in any other major activities along the way. After feeding in this tree the group changed direction and moved west to another fruit tree at 12:06 h.

(4) *Gibbon groups return to the same food sources on successive days.*

During the 6-day follows of gibbon groups each month, the number of times each tree or other food source is visited can be determined from the foraging tables, by filtering all the food sources out of the file. Figure 4 shows 6 daily paths superimposed on each other, for November 15–20, 2003. Two types of fruit sources are shown: figs (*Ficus* spp.) and *Choerospondias axillaris* trees. Figure 4 shows the number of times during the 6 days that the gibbons visited each fruit source. Some sources were visited 6 times, or every day.

Figure 5 shows the frequency distributions for number of visits per source for fruit trees and for leaf/flower/shoot plant sources. The latter types of foods were not generally visited repeatedly, and were probably more widely or finely distributed in the home range.

Future analyses will attempt to quantify the evidence for knowledge of the home range over the 3 years of data collection, and also examine the seasonal changes in ranging, and how this relates to food availability and also seed dispersal.

5. Seeds and seedling studies

Seeds and seedlings of species consumed by gibbons were collected during 2002 and 2003, and are still being collected as new species are found in the diet. A summary of the species consumed by gibbons is being prepared for a paper by Chuti-on Kanwatanakid and W. Y. Brockelman. A summary of the seed and seedling collections from Khao Yai Park is given in Table 3. Approximately 200 species of seeds are in the collection, which is kept both at BIOTEC and at Mahidol University, Salaya.

Germination studies.—The major fruit species consumed by gibbons were verified by seeds collected in their feces each month. Germination experiments were made both *in situ* (in the forest where they fell, or in small screen enclosures in the forest) and *ex situ*, in small cups or germinarion trays at the house in Khao Yai. Both defecated seeds and non-consumed seeds collected under the trees were used. The major objective was to determine in seeds were viable after passing the gut, and to compare germination of seeds dispersed by gibbons and those not dispersed or consumed. Tables 4 and 5 summarize these initial studies. We attempted to obtain sample sizes of 100 seeds in total, but for most species too few seeds were found.

Out of a total of 19 species tested from gibbon feces, 13 germinated at a rate higher than 10 % (Tables 4 and 5). Many other species known to be consumed were not found in great enough numbers in feces during the follows to test properly. Some species did not fruit well enough to be a major food source in late 2002 and early 2003 when most of the work was done.

6. Dispersal patterns of seeds

The seeds found in gibbon feces are listed for each tree and quadrat in which defecation (=D) occurs in the ranging files. These data can be used to construct a seed shadow for each species. The first species to be studied for seed dispersal by gibbons is

Choerospondias axillaris (Anacardiaceae), whose dispersers and seed predators were studied during 2003 and 2004.

***Choerospondias* fruiting and seed dispersal in 2003.**— This species, a middle story tree of family Anacardiaceae, continues to be a focus of research primarily because it appears to be a key species that supplies wildlife species with food during the time of year when few other succulent fruits are available. This species has a drupe-like fruit, which is eaten by squirrels and deer as well as gibbons. It is the most important fruit species in the lean season of Oct.–Dec., on which gibbons rely most heavily. Data of fruit production, ranging, and seed dispersal have been collected from 2003 through 2005. The intensity of feeding on *Choerospondias* increases from August to November, when the gibbons select this species every day.

Figure 6 shows the locations of all *Choerspondias* trees over 20 cm in DBH that fruited in the fall of 2003. These trees were checked for seeds on the ground in December of 2003, and scored as heavy fruiters (large dots) and light fruiters (smaller dots). There were 38 "heavy" and 30 "light" fruiters. In addition, the trees that were fed upon by group A during study of foraging each month are plotted in Figure 7. The two maps agree closely but not perfectly.

Figure 8 shows the distribution of seeds dropped in feces on the plot during the fruiting season of *Choerospondias* from July to late November. A total of 427 seeds were dropped in 248 fecal piles by the 2 group A adults, for an average of 3.26 seeds per defecation. The numbers of seeds per fecal mass is shown in Table 6, and a summary of the trees visited and seeds defecated by month is shown in Table 7. The distribution of the number of seeds per quadrat is also shown. It is clear that gibbons spread the seeds widely and away from the fruiting trees. These patterns will be analyzed for correlation and randomness later.

The gibbons appear to disperse *Choerospondias* more evenly and widely than do the deer that consume large quantities of fruits that have fallen on the ground and regurgitate them in piles of several hundred. Researchers are trying to determine which is the most important dispersal agent for *Choerospondias*. The question that also needs to be answered is whether gibbons, deer, or both are required for the tree to maintain an adequate recruitment rate. This is a problem presently being studied by students and other collaborators. For example, Mr. Wirong Chanthorn is studying fruit production, seed dispersal and the distribution of seeds and seedlings on the plot in relation to adult trees.

Presently the patterns defecated seeds of all fruit species are being summarized from the data and analyzed, for 2003 and for 2004. This process will take more time.

7. Frugivory, seed predation, and survival of undispersed seeds

As reported in the May progress report, two tree species heavily used by gibbons, ***Prunus javanica*** and ***Nephelium melliferum***, were studied in detail in March, April and May of 2004 to determine the role of gibbons in dispersal. These species had a large fruiting in that year. They were studied with the collaboration of Dr. Kim McConkey, now resident in India, and with the field help of two biology undergraduates, Arissara Pongsiri and Nakorn Pradit. The objectives were to (1) estimate the productivity of the trees; (2) determine what frugivores consumed the fruits or seeds of each species, and how they handled the fruits and seeds; (3) Determine which species of frugivores are likely to be the major dispersers; (4) study seed and seedling survival under the tree canopy.

Dispersal of *Nephelium melliferum*.—Observations of fruiting of *Nephelium melliferum* (Sapindaceae) have been made since 1990, and as this species is a favorite food of gibbons in April and May, research on the species has been increased. It is the third most common tree species on the plot, with about 26 trees > 10 cm in dbh per hectare, and reaches about 30 m in height and about 60 cm in dbh. Since new data on the species have been obtained during the last reporting period, some results will be given here. Figures 9-10 show rambutan fruits, gibbons eating rambutans in the forest, traps under a rambutan to catch fruits and seeds, and fruits in a trap in Khao Yai.

Tree fruiting record.—The fruiting of *Nephelium* trees has been studied since 1988, when a sample of approximately 11 trees known to be visited by gibbons was noted (Figure 11). The sample of trees was increased in successive years, but there are many trees on the plot that have never been seen to fruit. Fruiting was documented by the relative density of fruits, husks, and seeds on the ground under the tree near the end of the fruiting season in May or early June. In the 42 trees examined for at least 6 years, fruiting did not occur every year; on average they fruited in 32.5 percent of years, or about 1 in 3.

The variation in fruiting among years is greater than that among individual trees. A strong fruiting occurs every 2 to 3 years; the intervening years have very little fruiting. There seems to be an internal rhythm in fruiting because no tree has fruited heavily for 2 years in a row. The obvious synchrony, however, suggests that a strong climate signal controls the degree of fruiting. In some years (e.g., 2001), fruiting completely fails. There seems to be no long-term trend in the intensity of fruiting. The strong variation among years must have effects on the diets of animals that depend on *Nephelium* fruit, primarily squirrels and gibbons.

Fruit and seed consumption and seed dispersal were studied in four ways: (1) by observing animals visiting 3 fruiting rambutan trees for a total of 100 hours from dawn to dusk; (2) by following gibbons for 6 days in April and in May and recovering all seeds from their feces; (3) by trapping dropped fruits and seeds in nets (Figure 12–13) set in random positions under a sample of 8 trees; and (4) by setting out camera traps under selected rambutans to photograph terrestrial animals visiting the tree at night. Results are briefly described below.

Tree observations.—Five species of mammals, 2 primates and 3 squirrels, were seen feeding in the trees during the day, as listed in the table below. In addition, the deer were camera-trapped under the tree at night. Bears (species not known) were not seen but 230 seeds were found in one bear feces.

Species	Treatment	No. seeds removed	Seeds/ indiv/min	Dispersal?
Hylobates lar	swallow	3181	4.4	defecate in small clumps up to 500 m
Macaca nemestrina	suck pulp and drop seed	?	4.2	carry up to ca. 5 m
Ratufa bicolor	eat pulp and drop seed	581	1.5	under canopy
Callosciurus finlaysoni	eat pulp and drop seed	2245	1.6	under canopy
Tamiops mcclellandi	eat pulp and drop seed	few	?	under canopy
Bear	swallow fruit	?	?	defecate in large clump
Sambar deer	eat fruit and seed	?	?	seed predator
Muntjack	eat fruit and seed	hundreds per visit	?	seed predator

Gibbons were clearly the most efficient dispersers. Squirrels consumed large numbers of fruits but dropped the seeds under the canopy; they were believed to be removed by rodents. Monkeys sometimes dropped large numbers of partly consumed fruits, which were eaten by deer the following night. Monkeys there facilitated predation of large numbers of seeds.

Seed survival.—An experiment on seed survival performed in the forest showed that seeds dropped away from the tree had significantly higher survival than seeds placed under the canopy. This indicates that distance dispersal is likely to be highly beneficial to the species.

Gibbons foraged regularly on Rambutan fruits, visiting 5 to 11 trees per day during the peak of the fruiting period, spending an average of 53 minutes feeding in rambutan trees per day. An average of about 50 seeds were recovered from the feces of each adult per day (probably about 25–30 percent of the seeds were lost as they scattered while falling through the trees). Thus, the 4 gibbons of group A probably dispersed a total of about 5000 seeds in their home range during the month-long *Nephelium* fruiting season. During this time, the group visited a total of at least 26 rambutan trees.

Fruit trap collection.—The 80 fruit traps under the 8 sample trees caught a total of 92,000 fruits or remains of fruits. Gibbons dropped only husks, while squirrels and monkeys dropped fragments of husks and seeds. The 3 species of squirrels could be distinguished by the tooth-marks left on the seed coat. The total production of ripe fruit was used by the following species:

Gibbons	19 %
Monkeys	9 %
Variable squirrel (*Callosciurus*)	53 %
Giant squirrel (*Ratufa*)	1.4 %
Dropped unused	18 %

These percentages varied from tree to tree; gibbon consumption varied from 0 to 35 %, but was 0 in only 1 of the 8 sampled trees.

Camera trapping.—Cameras with infra-red sensors were placed under 3 trees, and under 2 of them deer (2 sambar and 1 muntjak or barking deer) were caught on film. No other animals were caught. The deer were consuming the fruits dropped by monkeys, and perhaps the seeds dropped by squirrels also. Deer are "seed predators" that chew up the soft seeds of *Nephelium*.

Tree distribution.—Figure 14 shows the distribution of the larger *Nephelium* trees (>10 cm dbh) on the plot. There is a disturbing feature of the distribution of smaller size classes <10 cm in dbh (Figure 15). The saplings have not regenerated well on the more south and west-facing slopes and lowland areas on the north and east sides of the plot. These are presumably the drier areas that receive more late afternoon sunlight. The gibbons of group A, which are the main seed dispersers of *Nephelium* on the plot, defecate over nearly all portions of the area, so that the apparent shift in distribution is not likely to be due to differences in seed rain over time. These are the first data from the plot that suggest that recent changes in climate causing increasing temperature are causing effects on forest dynamics. New studies are now being planned to determine if the changes in distribution are due to seed dispersal effects, or effects on seed or seedling (Figure 16) survival as caused by changes in climate.

Dispersal of *Aphananthe cuspidata* (Ulmaceae).—One species of rare tree that produces fruit gibbons like, *Aphananthe cuspidata*, was the subject of detailed study of fruit production, seed predation, and fruit fall during the fruiting period of August–November, 2003. Twelve traps 1-m^2 in size were placed at random locations under the tree canopy and whole fruits, and fruits predated by squirrels and monkeys, were counted in the traps. Fruits predated by squirrels (*Callosciurus finlaysoni*) and monkeys (*Macaca nemestrina*) are recognizable by the characteristic ways in which the fruit is split into halves to remove the endosperm of the seed. Gibbon consumption and dispersal was estimated by following group A and collecting feces containing the seeds. Seeds were germinated both in site and ex situ. Table 8 lists the animals that were seen visiting one of the large *Aphananthe* trees during 3 days in 2003.

Dispersal of *Prunus javanica.*—A special study was made of *Prunus javanica* (Roasceae) during 2004, which was a big fruiting year for this species. The study included observation of frugivores visiting the tree, measurement of fruit production in a sample of 8 trees, and study of seed and seedling survival under the canopy and beyond the canopy. Camera trapping was also done to determine what animals consumed the fruit that dropped on the ground.

Analysis of *Prunus javanica* dispersal is not complete, but a few results are available. This species has succulent yellow fruits (Figure 17) that are eaten by a large variety of animals. As in the case of *Nephelium*, gibbons appear to be the only animals that swallow and carry seeds away from the tree in significant numbers, although some birds do swallow the seeds. Monkeys (*Macaca nemestrina*) also consume some of the fruit, but do not swallow the seeds. They suck the flesh off the seed and drop it, perhaps after carrying it beyond the edge of the canopy, but most seeds are dropped under the tree.

Several clumps of bear feces were found around *Prunus javanica* trees which contained hundreds of seeds (Figure 18). Bears are therefore potential dispersers. It is not known whether the bears climbed the trees to obtain the fruit or whether they ate

them from the ground. *Prunus* fruits fall on the ground in large numbers when ripe (as do *Choerospondias* fruits) and become available to ground animals such as deer, pigs and rodents. Most of these animals probably eat the seeds rather than disperse them, but it is still unclear whether seeds and fruits on the ground are successfully dispersed by anything. Observations indicate that rodents carry some of the seeds to caches such as holes in logs and termite mounds (Figure 19), and some of these germinate. Most seeds, however, are probably killed by rodents.

An experiment in situ showed that seeds dropped by gibbons, squirrels and seeds from dropped fruit did not differ in ability to germinate and survive. Seeds dropped under the canopy also had the same survival ability as seeds placed farther away from the tree. Seeds placed in wire cages to exclude mammal predators survived at about twice the rate as seeds placed in the open.

Student Research Projects

Below are brief progress reports on the students working on the plot.

Ms. Chanpen Wongsiriphuak: Dispersal and recruitment of selected lianas. Field research is still in progress on the plot, but Chanpen has taken 9 months to visit Oregon State University for extra training.

Ms. Supreeda Tangprasertsiri: Dispersal and regeneration of secondary forest species near Mo Singto Plot. The mapping of trees in the secondary forest plot is complete and she is now completing the analysis of her data for her M.Sc. thesis.

Ms. Chomcheun Siripankaw: Study of ecology and dispersal of elephants using microsatellite DNA markers extracted from dung. M.Sc. thesis completed and she is beginning her Ph.D. research and has started collecting the dung of unknown animals for DNA extraction. She and Chalita have decided to move their projects from Khao Yai to Salak Phra Wildlife Sanctuary, Kanchanaburi. Both students are receiving special training in DNA extraction and microsatellite analysis under Dr. Lori Eggert at the University of Missouri.

Ms. Chalita Kongrit: Study of growth and population structure of elephants using microsatellite DNA markers extracted from dung. Her Ph.D. project is supported by a Royal Golden Jubilee Fellowship to support her research. She has also started her field work at Salak Phra Wildlife Sanctuary.

Mr. Wirong Chanthorn: Will work on the population dynamics and seed dispersal of the tree *Choerospondias axillaris* (Anacardiaceae). He has prepared his proposal and has started to collect data. At present, he has studied with a mathematical ecologist, Dr. Marc Dubios, in France for 6 months, and is now back working in Khao Yai.

Ms. Yingluck Ratanapongsai: Is beginning a M.Sc. project on the structure of the ecotone between primary and secondary forest, and secondary forest succession

Mr. Tommaso Savini (working under Dr. Christoph Boesch and Dr. Ulrich Reichard of the MPI Institute of Evolutionary Anthropology, Leipzig): Fruit food supply and

population structure and distribution of gibbons. Savini has finished his thesis work and is now defending it.

Mr. Jedediah Brodie: "Wildlife poaching, Seed Dispersal, and the Functional Similarity of Mammalian Frugivores in Thailand." In Khao Yai, Brodie's study focuses on the dispersal success of the tree *Choerospondias axillaris* by gibbons and deer. Brodie has been in Thailand three times to collect data for his thesis on seed survival and seedling recruitment on the plot at Mo Singto, and is now in the process of analyzing data and writing his thesis

Talks and Posters Given

Aug. 2004 Talk on "Ranging behavior and food selection in white-handed gibbons (*Hylobates lar*): How much is knowledge worth?" 20th Congress of the International Primatological Society, Turin, Italy, 24 August.

Oct. 2004 Poster on "Ranging behavior and food selection in white-handed gibbons (Hylobates lar), 8th BRT Annual Meeting, Surat Thani.

Nov. 2004 Poster on "Ranging behavior and food selection in white-handed gibbons (Hylobates lar), the Meeting of Institute of Science and Technology for Research and Development, Mahidol University, Salaya campus, Nakorn Phathom.

Oct. 2005 Poster on "Ecology of the wild rambutan, *Nephelium melliferum* Gagnep. (Sapindaceae), on the Mo Singto forest dynamics plot, Khao Yai National Park" and " Fruiting and seed dispersal in the wild rambutan, *Nephelium melliferum* Gagnep. (Sapindaceae), on the Mo Singto forest dynamics plot, Khao Yai National Park", 9th BRT Annual Meeting, Khonkaen.

Publications

Lertpanich, Kanok and W. Y. Brockelman. 2004 Lianas and Environmental Factors in the Mo Singto Biodiversity Research Plot, Khao Yai National Park, Thailand. *Natural History Journal of Chulalongkorn University* 3: 7-17.

Brockelman, W. Y. 2004. Ecology and the social structure of gibbons. *In* B.M.F. Galdikas, N. Briggs, L.K. Sheeran, G.L. Shapiro and J. Goodall, eds. *All Apes Great and Small*, vol. II. Kluwer Academic/Plenum Publishers.

The Mo Singto forest dynamics plot in Khao Yai National Park: description and research activities, by W. Y. Brockelman, A. Nathalang, and G. A. Gale (in manuscript).

Fruiting and seed dispersal of the forest tree *Nephelium melliferum* (Sapindaceae) in Khao Yai National Park, Central Thailand, by Warren Y. Brockelman and Kim R. McConkey (in preparation).

Fruiting and seed dispersal of the tree *Prunus javanica* (Rosaceae), by Kim R. McConkey and Warren Y.Brockelman (in preparation).

Trees and shrubs of the Mo Singto Forest Dynamics Plot, Khao Yai National Park, central Thailand: abundance and distributions, by Anutara Nathalang, Warren Y. Brockelman (in preparation).

Woody climbers of the Mo Singto Forest Dynamics Plot: vegetative characters and aid to identification, by Warren Y. Brockelman and J. F. Maxwell (in preparation).

Table 1. Example of gibbon ranging database, showing all trees entered by Group A female in one day.

DAY	INDIV.	NO.	TIME	QUAD.	TREE #	BE.1	BE.2	BE.3	BE.4	FOOD SP.
12 May 2003	And	1	5:20	4114	41232	W	GS			
	And	2	5:25	4114	41237	T				
	And	3	5:28	4215	24258	T				
	And	4	5:34	4215	42256	T				
	And	5	5:35	4214	42249	T				
	And	6	5:36	4314	43232	M	R			
	And	7	5:39	4314	43231	D	M	R		
	And	8	5:41	4313	43225	R	M	GS		
	And	9	5:43	4313	43223	T				
	And	10	5:48	4313	43225	VD	M	R	FL	Ficupu
	And	11	5:51	4313	43207	Fin				
	And	12	5:55	4313	43225	R	M	GS	D	
	And	13	6:01	4413	44421	T				
	And	14	6:01	4413	44209	R				
	And	15	6:02	4413	44208	T				
	And	16	6:02	4413	44205	T				
	And	17	6:03	4413	44202	R	M			
	And	18	6:04	4512	45196	FF				Nephme
	And	19	6:04	4412	44174	T				
	And	20	6:04	4412	44184	T				
	And	21	6:04	4412	44191	T				
	And	22	6:04	4413	44202	T				
	And	23	6:04	4413	44209	T				
	And	24	6:04	4413	44205	T				
	And	25	6:04	4413	44208	T				
	And	26	6:04	4314	43231	T				
	And	27	6:04	4314	43232	T				
	And	28	6:10	4114	41237	T				
	And	29	6:10	4115	41244	T				
	And	30	6:10	4014	40210	T				
	And	31	6:11	4015	40221	T				
	And	32	6:11	4014	40209	T				
	And	33	6:11	3915	39253	T				
	And	34	6:12	3913	39216	T				
	And	35	6:12	3914	39244	Fin				
	And	36	6:14	3914	39248	Fin				
	And	37	6:15	3715	37195	T				
	And	38	6:15	3716	37201	T				
	And	39	6:16	3615	36187	R				
	And	40	6:16	3615	36188	FF				Polysi
	And	41	6:18	3616	36197	T				
	And	42	6:18	3616	36196	T				
	And	43	6:18	3616	36193	T				
	And	44	6:18	3516	35188	T				
	And	45	6:18	3516	35192	T				
	And	46	6:18	3516	35193	T				
	And	47	6:18	3516	35194	T				
	And	48	6:19	3517	35226	T				
	And	49	6:19	3517	35230	T				
	And	50	6:20	3517	35238	T				
	And	51	6:20	3417	34216	VD				
	And	52	6:20	3417	34217	VD				
	And	53	6:20	3417	34231	VD				

DAY	INDIV.	NO.	TIME	QUAD.	TREE #	BE.1	BE.2	BE.3	BE.4	FOOD SP.
12 May 2003	And	56	6:21	3317	33234	VD				
	And	57	6:22	3317	33245	VD				
	And	58	6:22	3317	33247	VD				
	And	59	6:22	3317	33231	VD				
	And	60	6:22	3317	33232	VD				
	And	61	6:23	3317	33238	VD				
	And	62	6:23	3317	33234	VD				
	And	63	6:23	3317	33249	VD				
	And	64	6:24	3317	33241	VD				
	And	65	6:24	3217	32225	VD	R			
	And	66	6:26	3217	32224	R	M			
	And	67	6:28	3117	31192	T				
	And	68	6:28	3017	30209	VD				
	And	69	6:29	3016	30114	VD	M	R	G<	
	And	70	6:39	3015	30099	T				
	And	71	6:40	2916	29127	T				
	And	72	6:40	2916	29126	T				
	And	73	6:40	2916	29136	T				
	And	74	6:40	2816	28513	T				
	And	75	6:40	2916	29143	T				
	And	76	6:41	2816	28176	T				
	And	77	6:42	2816	28177	T				
	And	78	6:42	2816	28200	T				
	And	79	6:43	2716	27177	T				
	And	80	6:43	2716	27175	T				
	And	81	6:43	2616	26179	T				
	And	82	6:43	2516	25159	T				
	And	83	6:43	2516	25158	T				
	And	84	6:43	2516	25156	T				
	And	85	6:43	2515	25151	T				
	And	86	6:46	2416	24166	T				
	And	87	6:47	2416	24170	FF				Ficune
	And	88	7:21	2417	24179	FF				Ziziat
	And	89	7:22	2417	24181	T				
	And	90	7:22	2417	24184	FF				Ziziat
	And	91	7:23	2417	24181	T				
	And	92	7:26	2418	24189	T				
	And	93	7:27	2218	22197	T				
	And	94	7:28	2218	22192	R				
	And	95	7:29	2117	21164	T				
	And	96	7:32	2017	20158	Fin	M	R		
	And	97	7:35	2017	20147	R				
	And	98	7:38	2017	20148	R	M			
	And	99	7:43	2017	20145	R				
	And	100	7:44	1916	19238	R	M			
	And	101	7:47	1816	18234	FF				Ficuan
	And	102	7:57	1916	19238	T				
	And	103	7:57	1916	19236	T				
	And	104	7:58	1916	19235	T				
	And	105	7:58	1916	19228	T				
	And	106	7:58	1916	19227	T				
	And	107	7:58	1915	19226	D				
	And	108	7:59	1915	19216	T				
	And	109	7:59	1915	19212	R				
	And	110	8:01	1914	19209	M	R	Fin		
	And	111	8:04	1914	19211	T				
	And	112	8:04	2014	20104	T				

DAY	INDIV.	NO.	TIME	QUAD.	TREE #	BE.1	BE.2	BE.3	BE.4	FOOD SP.
12 May 2003	And	113	8:04	2014	20102	T				
	And	114	8:04	2014	20096	T				
	And	115	8:05	2013	20086	T				
	And	116	8:06	2013	20084	T				
	And	117	8:06	2113	21094	T				
	And	118	8:07	2113	21079	T				
	And	119	8:07	2113	21086	T				
	And	120	8:07	2113	21080	G<>				
	And	121	8:34	2113	21078	R				
	And	122	8:36	2212	22072	T				
	And	123	8:36	2311	23049	T				
	And	124	8:40	2311	23030	T				
	And	125	8:40	2311	23036	G<	R			
	And	126	8:43	2310	23013	FF				Salach
	And	127	8:53	2310	23009	VD				
	And	128	8:55	2310	23006	VD				
	And	129	8:56	2310	23008	VD	UR			
	And	130	8:56	2309	23306	VD				
	And	131	8:57	2309	23305	R				
	And	132	8:57	2309	23306	T				
	And	133	8:58	2309	23284	D	M	VD	R	
	And	134	8:59	2309	23285	VD	Fin			
	And	135	9:01	2309	23266	VD	M	R		
	And	136	9:04	2308	23262	VD	R	GS		
	And	137	9:06	2308	23259	VD	R	G<		
	And	138	9:18	2407	24279	T				
	And	139	9:19	2407	24265	T				
	And	140	9:20	2407	24264	T				
	And	141	9:20	2407	24263	T				
	And	142	9:24	2407	24262	T				
	And	143	9:24	2406	24251	T				
	And	144	9:24	2506	25265	T				
	And	145	9:24	2506	25262	T				
	And	146	9:24	2506	25253	T				
	And	147	9:24	2506	25246	T				
	And	148	9:24	2505	25233	T				
	And	149	9:24	2505	25232	T				
	And	150	9:24	2505	25224	T				
	And	151	9:24	2505	25223	T				
	And	152	9:24	2505	25222	T				
	And	153	9:24	2504	25489	T				
	And	154	9:24	2604	26451	T				
	And	155	9:24	2604	26448	T				
	And	156	9:24	2604	26442	R				
	And	157	9:24	2604	26439	T				
	And	158	9:25	2604	26440	R	M			
	And	159	9:29	2603	26511	Fin				
	And	160	9:31	2603	26505	T				
	And	161	9:32	2603	26507	R				
	And	162	9:34	2602	26488	R				
	And	163	9:36	2602	26486	T				
	And	164	9:37	2602	26475	T				
	And	165	9:37	2702	27506	T				
	And	166	9:37	2702	27512	R	M			
	And	167	9:41	2702	27516	R	M			
	And	168	9:43	2802	28546	Fin	M	R		
	And	169	9:45	2802	28549	FF				Salach

DAY	INDIV.	NO.	TIME	QUAD.	TREE #	BE.1	BE.2	BE.3	BE.4	FOOD SP.
12 May 2003	And	170	9:50	2802	28551	R	M	FF		Salach
	And	171	9:51	2802	28553	T				
	And	172	9:52	2802	28554	T				
	And	173	9:52	2802	28556	T				
	And	174	9:52	2802	28558	R				
	And	175	9:52	2902	29476	T				
	And	176	9:53	2902	29489	T				
	And	177	9:53	2902	29494	T				
	And	178	9:53	2902	29499	T				
	And	179	9:53	2903	29503	T				
	And	180	9:54	3002	30471	T				
	And	181	9:55	3002	30473	T				
	And	182	9:57	3002	30476	T				
	And	183	9:58	3003	30477	T				
	And	184	9:58	3003	30483	T				
	And	185	9:58	3005	30209	G<				
	And	186	10:07	3104	31406	T				
	And	187	10:08	3103	31511	T				
	And	188	10:09	3203	32506	R	M	G<>		
	And	189	10:22	3203	32521	Fin	M	R		
	And	190	10:25	3203	32506	T				
	And	191	10:25	3303	33563	T				
	And	192	10:25	3303	33560	T				
	And	193	10:25	3403	34550	R				
	And	194	10:25	3403	34552	T				
	And	195	10:25	3403	34559	T				
	And	196	10:25	3403	34557	T				
	And	197	10:27	3403	34556	FF				Nephme
	And	198	10:41	3403	35539	T				
	And	199	10:41	3503	35520	T	R			
	And	200	10:41	3503	35517	T				
	And	201	10:43	3503	35512	G<	M	C		
	And	202	10:49	3502	35503	T				
	And	203	10:49	3502	35499	T				
	And	204	10:49	3502	35498	T				
	And	205	10:49	3602	36489	T				
	And	206	10:50	3602	36491	T				
	And	207	10:50	3701	37447	R				
	And	208	10:53	3801	38468	R				
	And	209	10:55	3801	38472	Fin				
	And	210	10:58	3801	38475	R				
	And	211	10:59	3801	38480	R				
	And	212	11:02	3801	38477	Fin				
	And	213	11:02	3901	39477	T				
	And	214	11:03	3901	39474	R				
	And	215	11:04	3901	39467	R				
	And	216	11:04	3901	39465	T				
	And	217	11:05	3901	39465	R				
	And	218	11:06	4001	40481	R	VF			
	And	219	11:08	4001	40483	T				
	And	220	11:08	4001	40484	T				
	And	221	11:08	4001	40485	T				
	And	222	11:09	4001	40477	T				
	And	223	11:09	4001	40479	R	Fin	M	GS	
	And	224	11:30	4101	41521	R	M	Fin		
	And	225	11:33	4101	41524	T				
	And	226	11:34	4101	41511	VD	Fin			

DAY	INDIV.	NO.	TIME	QUAD.	TREE #	BE.1	BE.2	BE.3	BE.4	FOOD SP.
12 May 2003	And	227	11:36			VD	Fin			
	And	228	11:37			VD	D			
	And	229	11:39			VD				
	And	230	11:40			VD	M	R		
	And	231	11:46			VD				
	And	232	11:50			T				
	And	233	11:55			T				
	And	234	12:05			R				
	And	235	12:09			R				
	And	236	12:13			T				
	And	237	12:14			R				
	And	238	12:15			T				
	And	239	12:16			R				
	And	240	12:19			R	FL			Girone
	And	241	12:21			R				
	And	242	12:23			T				
	And	243	12:25			R				
	And	244	12:35			G<				
	And	245	12:35			R	M			
	And	246	12:38			R				
	And	247	12:41			T				
	And	248	12:41			R				
	And	249	12:43			R				
	And	250	12:47			T				
	And	251	12:47			R				
	And	252	12:48			T				
	And	253	12:48			R				
	And	254	12:50			T				
	And	255	12:50			R				
	And	256	12:51	4601	46005	R				
	And	257	12:52	4601	46009	T				
	And	258	12:52	4601	46011	T				
	And	259	12:53	4601	46015	T				
	And	260	12:53	4601	46017	T				
	And	261	12:54			T				
	And	262	12:55			T				
	And	263	12:55			T				
	And	264	12:55	4602	46033	T				
	And	265	12:56	4602	49034	D				
	And	266	12:57	4603	46042	T				
	And	267	12:58	4603	46056	T				
	And	268	12:58	4603	46059	T				
	And	269	12:58	4501	45546	T				
	And	270	12:58	4503	45548	T				
	And	271	12:58	4503	45479	T				
	And	272	12:59	4404	44006	T				
	And	273	12:59	4404	44005	FF				Aglael
	And	274	13:01	4504	45002	T				
	And	275	13:01	4504	45019	T				
	And	276	13:01	4504	45024	T				
	And	277	13:01	4505	45031	T				
	And	278	13:01	4505	45033	T				
	And	279	13:02	4505	45030	T				
	And	280	13:02	4405	44035	T				
	And	281	13:02	4305	43032	T				
	And	282	13:02	4305	43033	T				
	And	283	13:02	4305	43034	T				

DAY	INDIV.	NO.	TIME	QUAD.	TREE #	BE.1	BE.2	BE.3	BE.4	FOOD SP.
12 May 2003	And	284	13:02	4306	43055	T				
	And	285	13:02	4306	43042	T				
	And	286	13:02	4306	43048	T				
	And	287	13:02	4306	43054	T				
	And	288	13:02	4306	43056	T				
	And	289	13:02	4307	43066	T				
	And	290	13:02	4307	43072	T				
	And	291	13:02	4307	43071	T				
	And	292	13:02	4307	43074	T				
	And	293	13:02	4307	43083	T				
	And	294	13:02	4307	43084	T				
	And	295	13:02	4308	43092	T				
	And	296	13:02	4308	43096	T				
	And	297	13:02	4308	43105	T				
	And	298	13:02	4308	43109	T				
	And	299	13:02	4409	44117	T				
	And	300	13:02	4409	44118	T				
	And	301	13:02	4409	44131	T				
	And	302	13:02	4410	44134	T				
	And	303	13:02	4410	44137	T				
	And	304	13:02	4410	44140	T				
	And	305	13:02	4410	44144	T				
	And	306	13:02	4410	44146	T				
	And	307	13:02	4510	45147	T				
	And	308	13:02	4511	45160	T				
	And	309	13:02	4511	45158	T				
	And	310	13:02	4511	45168	T				
	And	311	13:02	4512	45184	T				
	And	312	13:02	4414	44174	T				
	And	313	13:06	4512	45196	FF				Nephme
	And	314	14:10	4412	44174	UR				
	And	315	14:12	4412	44184	T				
	And	316	14:13	4412	44180	Fin	M			
	And	317	14:15	4412	44189	R				
	And	318	14:17	4412	44191	R				
	And	319	14:18	4413	44205	R				
	And	320	14:19	4413	44210	T				
	And	321	14:20	4414	44220	T				
	And	322	14:20	4414	44219	T				
	And	323	14:20	4314	43237	T				
	And	324	14:20	4314	43235	T				
	And	325	14:20	4314	43240	T				
	And	326	14:20	4315	43256	R	M	FL		Ficupu
	And	327	14:26	4315	43266	T				
	And	328	14:26	4316	43270	T				
	And	329	14:26	4316	43274	T				
	And	340	14:27	4216	42285	T				
	And	341	14:27	4217	42295	N				

Table 2. Summary of foraging data for group A on Mo Singto Plot for 2003

Date	Indiv.	Time	Hours,min	Hours	Trees, N	Trees/h	Quadrats	Distance,m
9Jan03	And	0610-1347	7:37	7.62	196	25.73		
9Jan03	Chr	0629-1331	7:02	7.03	192	27.30		
13Jan03	And	0615-1417	8:02	8.03	148	18.42		
13Jan03	Chr	0618-1411	7:53	7.88	118	14.97		
14Jan03	And	0632-1426	7:54	7.90	149	18.86		
15Jan03	And	0610-1417	8:07	8.12	102	12.57		
15Jan03	Chr	0622-1235N	6:13	6.22	65	10.46		
29Jan03	And	0627-1434	8:07	8.12	132	16.26		
29Jan03	Chr	0641-1355	7:14	7.23	143	19.77		
5 Feb03	And	0645-1319N	6:34	6.57	116	17.66		
5 Feb03	Chr	0632-1310N	6:38	6.63	117	17.64		
6 Feb03	Chr	0633-1258N	6:25	6.42	94	14.65		
7 Feb03	And	0630-1310N	6:40	6.60	61	9.24		
7 Feb03	Chr	0647-1308N	6:21	6.35	60	9.45		
8 Feb03	And	0642-1413N	7:31	7.52	79	10.51		
8 Feb03	Chr	0639-1406N	7:27	7.45	57	7.65		
9 Feb03	And	0626-1353N	7:27	7.45	96	12.89		
9 Feb03	Chr	0628-1243N!	6:15	6.25	47	7.52		
5 Mar03	And	0609-1439	8:30	8.50	204	25.45		
5 Mar03	Chr	0620-1431	8:11	8.18	203	23.74		
6 Mar03	And	0620-1446	8:26	8.43	187	22.17		
6 Mar03	Chr	0606-1446	8:40	8.67	206	23.77		
7 Mar03	And	0612-1515	9:03	9.05	267	29.50		
28 Mar03	And	0619-1452	8:33	8.55	362	42.34		
28 Mar03	Chr	0608-1554	9:46	9.77	385	39.42		
29 Mar03	Chr	0600-1440	8:40	8.67	272	31.38		
8 Apr03	And	0542-1509	9:27	9.90	263	26.57		
9 Apr03	And	0530-1522	9:52	9.87	412	41.76		
10 Apr03	And	0529-1529	10:00	10.00	259	25.90		
27 Apr03	Chr	0536-1524	9:48	9.80	442	45.10		
28 Apr03	Chr	0531-1511	9:40	9.67	479	49.55		
12 May03	And	0520-1427	9:07	9.12	341	37.40		
13 May03	Chr	0547-1215L	6:28	6.47	142	21.96		
15-May-03	And	0530-1519	9:49	9.82	321	32.70		
16-May-03	And	0537-1532	9:55	9.92	299	30.15		
17-May-03	And	0520-1527	10:07	10.12	299	29.56		
8-Jun-03	And	0523-1455	9:32	9.53	253	26.54		
9-Jun-03	And	0524-1541	10:17	10.28	348	33.84		
9-Jun-03	Chr	0530-1544	10:14	10.23	444	43.39		
10-Jun-03	And	0520-1548	10:28	10.47	235	22.45		
16-Jun-03	And	0450-1113L	6:23	6.38	201	31.49		
18-Jun-03	And	0526-1455	9:29	9.48	221	23.30		
19-Jun-03	And	0510-1447	9:37	9.62	404	42.01		
24Jul03	And	0528-1449	9:21	9.35	153	16.36		1309
25Jul03	And	0550-1543	9:53	9.88	365	36.93		2611
26Jul03	And	0537-1505	9:28	9.47	288	30.42		2458
27Jul03	And	0527-1442	9:15	9.25	216	23.35		1711
28Jul03	And	0527-1510	9:43	9.72	348	35.81		2772
26Aug03	And	0545-1504	9:19	9.32	218	23.40		1835

27Aug03	And	0541-1510	9:29	9.48	354	37.33		2599
28Aug03	And	0535-1500	9:25	9.42	345	36.64		2991
29Aug03	And	0520-1533	10:13	10.22	332	32.50		2676
30Aug03	And	0531-1527	9:56	9.93	338	34.03		2685
23Sept03	And	0540-1436	8:56	8.93	200	22.39		1674
24Sept03	And	0543-1406	8:23	8.38	115	13.72		998
25Sept03	And	0546-1431	8:45	8.75	235	26.86		2082
26Sept03	And	0542-1445	9:03	9.05	294	32.49		2103
27Sept03	And	0522-1505	9:43	9.72	280	28.82		2285
4Oct03	And	0550-1425	8:35	8.58	332	38.68		2303
5Oct03	And	0540-1558	10:18	10.30	321	31.17		2407
6Oct03	And	0543-1448	9:05	9.08	195	21.47		1394
7Oct03	And	0541-1504	9:23	9.38	217	23.13		1592
8Oct03	And	0540-1431	8:51	8.85	171	19.32		1387
9Oct03	And	0540-1450	9:10	9.17	237	25.85		1784
15Nov03	And	0530-1500	9:30	9.50	167	17.58		1218
16Nov03	And	0515-1408	8:53	8.88	157	17.67		1236
17Nov03	And	0555-1443	8:48	8.80	212	24.09		1683
17Nov03	Chr	0555-1516	9:39	9.65	289	29.95		2222
18Nov03	And	0550-1403	8:47	8.78	205	23.34		1578
19Nov03	And	0600-1352	7:52	7.87	234	29.75		1668
20Nov03	And	0600-1408	8:08	8.13	238	29.26		1743
3Dec03	And	0840-1352	5:12	5.20	86	16.54		747
4Dec03	And	0600-1341	7:41	7.68	130	16.92		1005
4Dec03	Chr	0555-1338	7:43	7.72	167	21.64		1302
5Dec03	And	0600-1413	8:13	8.22	165	20.08		1260
6Dec03	And	0612-1425	8:13	8.22	154	18.74		1157
7Dec03	And	0600-1446	8:46	8.77	170	19.39		1390
8Dec03	And	0600-1431	8:31	8.52	162	19.02		1266

Table 3. List of seed collection in Ecology Lab, BIOTEC Herbarium

Botanical name	Family	Collector number	Date	Notes
Acronychia pedunculata (L.) Miq.	Rutaceae	P. Charoenchia 936	30 Mar. 00	KYN
Acronychia pedunculata (L.) Miq.	Rutaceae	S. Chomchin 6	18 Aug. 02	KYN, 750 m.
Aglaia edulis (Roxb.) Wall.	Meliaceae	S. Chongko	4 May. 02	From gibbn (Roong) feces
Aglaia edulis (Roxb.) Wall.	Meliaceae	S. Chongko 133	28 Apr. 02	KYN, 720 m.
Aglaia elaeagnoidea (A. Juss.) Bth.	Meliaceae	A. Boonkongchart 213	20 May. 03	Q. 3907
Aglaia elaeagnoidea (A. Juss.) Bth.	Meliaceae	S. Chongko	21 Apr. 01	from Andromeda feces, Q. 3406
Aglaia elaeagnoidea (A. Juss.) Bth.	Meliaceae	A. Boonkongchart 206	12 May. 03	KYN
Aglaia lawii (Wight) Sald. *ex* Rama.	Meliaceae	A. Boonkongchart 216	8 May. 03	KNY, R trail
Aglaia lawii (Wight) Sald. *ex* Rama.	Meliaceae	S. Chongko 127	5 Jul. 02	KYN
Aglaia odoratissima Blume	Meliaceae	A. Boonkongchart 222	17 May. 03	A 9.0 trail near ranger's house
Aglaia spectabilis (Miq.) Jain & Benn.	Meliaceae	A. Boonkongchart 226	15 Apr. 03	Q. 4511 #167
Aglaia spectabilis (Miq.) Jain & Benn.	Meliaceae	N. Tanthana & S. Chomchin 58	22 Apr. 02	KYN.
Aidia sp.	Rubiaceaea	W.Y. Brockelman	22 Sep. 96	KYN, gibbon eating, R 0.5
Alangium kurzii Craib	Alangiaceae	J.F. Maxwell 02-175	8 Jul. 02	KYN, 750 m.
Alchornea tiliifolia (Bth.) M.-A.	Euphorbiaceae	J.F. Maxwell 02-186	10 Jul. 02	KYN
Alphonsea boniana Fin. & Gagnep.	Annonaceae	C. Kanwatanakid		KYN
Alpinia malaccensis (Burm. f.) Rosc.	Zingiberaceae	J.F. Maxwell 02-303	6 Sep. 02	KYN
Alyxia thailandica Midd.	Apocynaceae	J.F. Maxwell 02-192	11 Jul. 02	KYN, 1200 m.
Antiaris toxicaria Lesch.	Moraceae	A. Boonkongchart 228	15 Mar. 03	KYN, Klong Sai
Aphanamixis polystachya (Wall.) R.N. Parker	Meliaceae	S. Chongko 127	18 Dec. 01	KYN
Aphanathe cuspidata (Bl.) Planch.	Ulmaceae	P. Charoenchia	24 Jun. 00	KYN
Aporusa octandra (B.-H. *ex*D. Don) Vick. var. *octandra*	Euphorbiaceae	J.F. Maxwell 02-69	13 Mar. 02	KYN
Aquilaria crassna Pierre *ex* Lec.	Thymelaeaceae	W.Y. Brockelman	21 May. 02	near Intanin (gibbon'house) near road
Aquilaria crassna Pierre *ex* Lec.	Thymelaeaceae	A. Boonkongchart238	25 Jun. 03	Q.2802
Aquilaria crassna Pierre *ex* Lec.	Thymelaeaceae	W.Y. Brockelman	18 Oct. 03	KYN, Q. 3010 #018
Ardisia crenata Sims var. *crenata*	Myrsinaceae	J.F. Maxwell 02-193	11 Jul. 02	KYN, 1225
Ardisia villosa Roxb.	Myrsinaceae	J.F. Maxwell	13 Mar. 02	KYN
Baccaurea ramiflora Lour.	Euphorbiaceae	J.F. Maxwell	May. 02	Chiang Mai
Baccaurea ramiflora Lour.	Euphorbiaceae	W.Y. Brockelman	21 May. 02	KYN
Balakata baccata (Roxb.) Ess.	Euphorbiaceae	S. Chongko	28-29 May. 03	from Andromeda & Christopher feces
Beilschmiedia aff. *intermedia*Allen	Lauraceae	A. Boonkongchart 225	3 Apr. 03	Q. 4006 #041
Beilschmiedia aff. *intermedia*Allen	Lauraceae	J.F. Maxwell 02-95	12 Mar. 02	KYN
Beilschmiedia aff. *intermedia*Allen	Lauraceae	W.Y. Brockelman	3-6 Apr. 03	Q. 4006 #041. B. sp. 3
Beilschmiedia maingayi Hk. f.	Lauraceae	A. Boonkongchart 220	6 Apr. 03	Q. 3904 #444, B. sp. 2
Beilschmiedia maingayi Hk. f.	Lauraceae	W.Y. Brockelman	5 Apr. 03	Q. 3504 #444, B. sp. 2
Bhesa robusta (Roxb.) Hou	Celastraceae	A. Boonkongchart 211	9 Apr. 03	Q. 2312 #049
Bhesa robusta (Roxb.) Hou	Celastraceae	P. Charoenchia	25 Jan. 01	KYN
Bridelia insulana Hance	Euphorbiaceae	N. Tanthana 6	11 Mar. 02	KYN
Bridelia insulana Hance	Euphorbiaceae	S. Chongko	8 Apr. 03	from Andromeda feces
Bridelia insulana Hance	Euphorbiaceae	W.Y. Brockelman 28	5 Apr. 95	KYN
Buchanania arborescens (Bl.) Bl.	Anacardiaceae	P. Chroenchai 930	26 Sep. 98	KYN
Camellia oleifera Abel var. *confusa*(Craib) Sealy	Theaceae	A. Boonkongchart 214	6 May. 03	Q. 4323
Canarium euphyllum Kurz	Burseraceae	S. Chongko & A. Boonkongchart 141	10 Aug. 02	KYN, 776 m., Q. 2422 #391

Botanical name	Family	Collector number	Date	Notes
Canarium euphyllum Kurz	Burseraceae	W.Y. Brockelman	9 Sep. 94	Q.4002 #365
Canthium coffeoides Pierre *ex* Pit.	Rubiaceaea	W.Y. Brockelman 15	24 Sep. 95	Kong Kaew-Hiew Suwat trail
Casearia grewiifolia Vent. var. *gelonioides* (Bl.) Sleum.	Flacourtiaceae	A. Boonkongchart & S. Chomchin 134	30 Jun. 02	KYN, 792 m.
Celastrus paniculatus Willd.	Celastraceae	J.F. Maxwell 01-749	12 Mar. 02	KYN
Chaetocarpus castanocarpus (Roxb.) Thw.	Euphorbiaceae	P. Charoenchai	25 Jan. 01	KYN
Chionanthus ramiflorus Roxb.	Oleaceae	J.F. Maxwell 02-24	22 Jan. 02	KYN
Chionanthus ramiflorus Roxb.	Oleaceae	P. Charoenchia 796	13 Dec. 98	KYN
Chisocheton grandiflorus (Kurz) Hiern	Meliaceae	S. Chonko 129	3 Feb. 02	KYN
Cinnamomum iners Reinw. *ex* Blume	Lauraceae	W.Y. Brockelman	8 Apr. 02	from tree near driveway of gibbon house
Cinnamomum subavenium (Miq.)	Lauraceae	O. Petrmitr	14 Mar.02	KYN
Cinnamomum subavenium (Miq.)	Lauraceae	W.Y. Brockelman	10 Feb. 96	KYN
Cleistocalyx operculatus Merr & Perry	Myrtaceae	C. Kahwattanakid 42	May. 97	KYN
Cleistocalyx operculatus Merr & Perry	Myrtaceae	P. Charoenchai	18 Mar. 00	KYN
Croton kongensis Gagnep.	Euphorbiaceae	N. Tanthana 63	11 Jul. 02	KYN, 1200 m.
Cruddasia pinnata	Leguminosae, Papilionoideae	J.F. Maxwell 01-745	18 Dec. 01	
Daemonoropsis jenkisiana (Griff.) Mart.	Palmae	J.F. Maxwell	14 Mar. 02	Q. 2102
Daphniphyllum cambodianum Gagnep.	Daphniphyllaceae	P. Charoenchai 406	27 Sep. 97	KYN
Daphniphyllum cambodianum Gagnep.	Daphniphyllaceae	A. Boonkingchart 166	3 Nov. 02	KYN
Desmos dumosus (Roxb.) Saff. var. *glabrior*Craib	Annonaceae	A. Boonkingchart 224	4 Jan. 03	Q. 4410
Desmos dumosus (Roxb.) Saff. var. *glabrior*Craib	Annonaceae	J.F. Maxwell 02-318	7 Sep. 02	KYN
Desmos dumosus (Roxb.) Saff. var. *glabrior*Craib	Annonaceae	P./Charoenchia 478	14 Dce. 00	KYN
Diosptros glandulosa Lace.	Ebenaceae	P. Charoenchai	23 Sep. 97	KYN
Diosptros glandulosa Lace.	Ebenaceae	T.Q. Bartlett	Sep. 95	Tree Bartlett #95
Diploclisia glaucescens (Bl.) Diels	Menespermaceae	W.Y. Brockelman	11 May. 03	MST, from liana #3257
Elaeagnus conferta Roxb.	Elaeocarpaceae	P. Charoenchai 490	29 Dec. 98	KNY
Elaeocarpus griffithii (Wight) A. Grey	Elaeocarpaceae	J.F. Maxwell	12 Sep.02	KYN, 650 m.
Elaeocarpus griffithii (Wight) A. Grey	Elaeocarpaceae	C. Kanwatanakid 54	Dec. 98	KYN
Elaeocarpus robustus Roxb.	Elaeocarpaceae	W.Y. Brockelman 108	21 Oct. 02	Along A.trail at E. edge of Mo Singto Plot
Eugenia grandis Wight var. *grandis*	Myrtaceae	P. Charoenchai	4 Jun. 02	KYN, Syzygium grande(Wight)Walp.var. grande
Eugenia syzygioides(Miq.) Hend.	Myrtaceae	A. Boonkongchart	4 Apr. 03	Q. 3003 #481, *Syzygium syzygioides* (Miq.) Hend.
Eugenia syzygioides(Miq.) Hend.	Myrtaceae	S. Chongko	10 Apr. 03	from Andromeda feces, *Syzygium syzygioides*(Miq.) Hend.
Fissistigma oblongum (Craib) Merrill	Annonaceae	J.F. Maxwell 02-169	7 Jul. 02	KYN, 750 m., *F.* aff. *rubinosum* (A. DC.) Merr.
Fissistigma oblongum (Craib) Merrill	Annonaceae	P. Charoenchia 325	18 Jul. 97	*F. rubignosa* (A. DC.) Merr.
Garcinia benthamii Pierre	Gutttiferae	W.Y. Brockelman	7 Sep. 94	Tree No. 29098
Garcinia cowa Roxb.	Gutttiferae	W.Y. Brockelman	6 Jul. 03	KYN
Girroniera nervosa Pl.	Ulmaceae	J.F. Maxwell 00-372	13 Aug. 00	KYN
Girroniera nervosa Pl.	Ulmaceae	W.Y. Brockelman	25 Sep. 94	near S. trail
Gnetum montanum Mgf.	Gnetaceae	S. Chongko	15 May. 03	from Andromeda feces
Helicia formosana Hemsl. var. *oblonceolata*Sleum.	Proteaceae	A. Boonkongchat 224	20 Apr. 03	Q. 4024 #435
Helicia nilagirica Bedd.	Proteaceae	N. Tanthana & A. Boonkongchart 25	27 Mar. 02	Q. 3824 #378

Botanical name	Family	Collector number	Date	Notes
Horsfieldia amygdalina (Wall.) Warb. var. *amygdalina*	Mtristicaceae	N. Tanthana, A. Boonkongchart & S . Chongko 52	5 Apr. 02	KYN
Horsfieldia amygdalina (Wall.) Warb. var. *amygdalina*	Mtristicaceae	W.Y. Brockelman 35	1 May. 95	KYN
Horsfieldia brachiata (King) Warb.	Mtristicaceae	N. Tanthana 03-12	19 Feb. 03	Hala-Bala, 300 m
Ilex chevalieri Tard.	Aquifoliaceae	W.Y. Brockelman	22 Sep. 96	L-trail, fruits on ground
Ixora amoena Wall. *ex* G. Don	Rubiaceaea	J.F. Maxwell 02-208	13 Jul. 02	KYN, 675 m.
*Knema elegans*Warb.	Myristicaceae	A. Boonkongchart 218	26 Apr. 03	Q. 3806 #042
Knema laurina (Bl.) Warb.	Myristicaceae	W.Y. Brockelman	22 Apr. 95	KYN
Lagerstroemia reginae Roxb.	Lythraceae	J.F. Maxwell 02-172	8 Jul. 02	KYN, 750 m.
Lagerstroemia speciosa (L.) Pers. var. *speciosa*	Lythraceae	J.F. Maxwell 02-170	8 Jul. 02	KYN, 750 m.
Leea indica (Burm. f.) Merr.	Leeaceae	J. Aramwith 4	16 Aug. 02	KYN
Lepisanthes tetraphylla (Vahl) Radlk.	Sapindaceae	A. Boonkongchart 217	15 Jun. 03	KYN, RA 2.6 trail, Wang Jumpee
Macaranga kurzii (O.K.) Pax & Hoffm.	Euphorbiaceae	N. Tanthana 70	8 Sep. 02	KYN, 1015 m.
Mallotus paniculatus (Lmk.) M.-A.	Euphorbiaceae	A. Boonkongchart 223	4 Jan. 03	Q. 1825 #391
Mallotus philippensis (Lmk.) M.-A.	Euphorbiaceae	A. Boonkongchart 123	17 Jun. 02	KYN, 750 m.
Mastixia pentandra Bl. ssp. *chinensis* (Merr.) Matt.	Cornaceae	W.Y. Brockelman 13	25 Sep. 94	KYN, near taril A-A24
Mastixia pentandra Bl. ssp. *chinensis* (Merr.) Matt.	Cronaceae	J.F. Maxwell	12 Sep. 02	KYN, Pah Dabaek Falls, 650 m.
Melicope pteleifolia (Champ. *ex* Bth.) T. Hart.	Rutaceae	J.F. Maxwell 01-384	6 Sep. 01	KYN
Memecylon lilacinum Zoll. & Mor.	Melastomataceae	J.F. Maxwell 02-344	10 Sep. 02	KYN
Michelia baillonii Pierre	Magnoliaceae	P. Charoenchia 71	15 Jul. 96	KYN
Michelia baillonii Pierre	Magnoliaceae	S. Nimnuan 2	11 Jun. 03	KYN
Miliura lineata (Craib) Ast	Annonaceae	A. Boonkongchart 136	30 Jun. 02	KYN, 790 m.
Miliura lineata (Craib) Ast	Annonaceae	J.F. Maxwell	10 Jul. 02	KYN, 800 m.
Miliura lineata (Craib) Ast	Annonaceae	P. Charoenchai	20 Sep. 97	KYN
Miliura lineata (Craib) Ast	Annonaceae	S. Chongko	9-11 Jun. 03	from Andromeda feces
Morinda villosa Hk. f.	Rubiaceaea	J.F. Maxwell	10 Jul. 02	KYN
Mucuna entanda	Leguminosae, Papilionoideae	A. Boonkongchart 219	6 Jun. 03	KYN, Ban Dongteaw
Nephelium melliferum Gagnep.	Sapindaceae	C. Kanwatanakid	May. 96	KYN
Nephelium melliferum Gagnep.	Sapindaceae	P. Charoenchai	May. 96	KYN
Nephelium melliferum Gagnep.	Sapindaceae	S. Chongko	12-16 May. 03	from Andromeda feces
Paranephelium macrophyllum King	Sapindaceae	A. Dangnum 7	28 Jan. 03	Hala-Bala
Phyllanthus emblica L.	Euphorbiaceae	P. Charoenchai	13 Aug. 02	KYN
Phyllanthus roseus (Craib & Hutch.) Beille	Euphorbiaceae	N. Tanthana 72	9 Sep. 02	KYN, 740 m.
Piper ribesioides Wall.	Piperaceaea	J.F. Maxwell & A. Boonkongchart 01-759	19 Dec. 01	KYN
Piper retrofractum Vahl	Piperaceaea	W.Y. Brockelman 124	14 Mar. 02	KYN, 747 m.
Platymitra macrocarpa Boerl.	Annonaceae	P. Charoenchai 1027	14 Oct. 94	tree no. 22119
Polyalthia evecta (Pierre) Fin. & Gagnep. var. *evecta*	Annonaceae	A. Boonkongchart 142	22 Aug. 02	KYN, 790 m.
Polyalthia evecta (Pierre) Fin. & Gagnep. var. *evecta*	Annonaceae	P. Charoenchai	23 Oct. 97	KYN, ลำดวนดง
Polyalthia hookerina King	Annonaceae	N. Tanthana 03-11	19 Feb. 03	Hala-Bala
Polyathia simiarum (Ham. *ex* Hk. f. & Th.) Bth. *ex* Hk. f. & Th.	Annonaceae	J.F. Maxwell 02-93	13 Mar. 02	KYN
Polyathia simiarum (Ham. *ex* Hk. f. & Th.) Bth. *ex* Hk. f. & Th.	Annonaceae	P. Charoenchia	24 May. 97	KYN, P. viridis Craib
Polyosma elongata Gedd.	Polyosmaceae (Escalloniaceae, Grossulariaceae)	S. Chongko 179	24 Oct. 02	KYN, Q. 4108 #108

Botanical name	Family	Collector number	Date	Notes
Pothos chinensis (Raf.) Merr.	Araceae	N. Tanthana & A. Boonkongchart 51	4 Apr. 02	KYN
Pouteria stellibacca Maxw.	Sapotaceae	A. Boonkongchart & S. Chongko 146	29 Aug. 02	KYN
Prunus javanica (T. & B.) Miq.	Rosaceae	A. Boonkongchart 213	6 Apr. 03	Q. 4602 #034
Prunus javanica (T. & B.) Miq.	Rosaceae	P. Charoenchia 741	16 Feb. 99	KYN
Prunus javanica (T. & B.) Miq.	Rosaceae	S. Chongko	8-9 Apr. 03	from Andromeda feces
Psychotria rubra (Loul.) Poir.	Rubiaceaea	P. Charoenchia 449	9 Nov. 97	KYN
Quercus brandisiana Kurz	Fagaceae	P. Charoenchai	20 Aug. 00	Khao Kaew, ก่อเสียด
Rapanea yunnanensis Mez	Myrsinaceae	J.F. Maxwell 02-190	11 Jul. 02	KYN, 1200m.
Rhamnus nipalensis (Wall.) Laws.	Rhamnaceae	S. Chongko	24 Apr. 01	from Akira's feces fea on wc 122 Q. 2720 #360
Rhus rhetsoides Craib	Anacardiaceae	P. Charoenchai 726	27 Sep. 98	KYN
Salacca cochinchinensis	Palmae	W.Y. Brockelman	8 May. 01	KYN, fruits on ground
Salacia chinensis L.	Celastraceae	S. Chongko	13 Apr. 03	KYN, L trail
Sandoricum koetjape (Burm. f.) Merr.	Meliaceae	J.F. Maxwell 02-176	9 Jul. 02	KYN, 775 m.
Sarcosperma arboreum Bth.	Sapotaceae	N. Tanthana & A. Boonkongchart 14	16 Mar. 02	KYN
Schefflera elliptica (Bl.) Harms	Araliaceae	W.Y. Brockelman 59	17 Mar. 00	KYN
Schefflera heptaphylla (L.) Frodin	Araliaceae	J.F. Maxwell 01-762	20 Dec. 01	KYN
Schefflera schizophylla (Hance) Frodin	Araliaceae	J.F. Maxwell 02-333	9 Sep. 02	KYN, *S. heptaphylla* (L.) Frodin
Schefflera heptaphylla (L.) Frodin	Araliaceae	W.Y. Brockelman	21 Jan. 01	KYN,group T,south of plot
Schefflera heptaphylla (L.) Frodin	Araliaceae	W.Y. Brockelman 123	22 Dec. 01	Tree no. 34201
Schima wallichii (DC.) Korth.	Theaceae	O. Petrmitr 525	8Jul. 02	KYN, 750 m.
Sloanea sigun (Bl.) K. Schum.	Elaeocarpaceae	A. Boonkongchart 128	19 Jun. 02	KYN, 770 m.
Spondias axillaris Burtt & Hill	Anacardiaceae	P. Charoenchai	11 Aug. 96	Seesiatthet
Sterculia guttara Roxb.	Sterculiaceae	A. Boonkongchart 221	26 Apr. 03	Q. 3012 #056
Strychnos lanata Hill	Loganiaceae	W.Y. Brockelman	6 Apr. 03	Q. 4006 #044, Cl. 8891,2
Symplocos cochinchinensis (Lour.) S. Moore. ssp. laurina	Symplocaceae	M. Promchua 2	3 Apr. 03	KYN, 760 m
Tetradium glabrifolium (Champ. *ex* Bth.) T. Hart.	Rutaceae	J.F. Maxwell 02-301	6 Sep. 02	KYN
Tetradium glabrifolium (Champ. *ex* Bth.) T. Hart.	Rutaceae	P. Charoenchia 553	18 Jul. 98	KYN,Euodia meliifolia (Hance) Bth.
Tetrastigma aff. *pyriforme* Gagnep.	Vitaceae	A. Boonkongchart 94	27 Sep. 01	KYN
Tetrastigma aff. *pyriforme* Gagnep.	Vitaceae	S. Chongko	13 Dec. 02	from Andromeda feces
Toddalia asiatica (L.) Lmk.	Rutaceae	J.F. Maxwell	12 Sep. 02	KYN
Toddalia asiatica (L.) Lmk.	Rutaceae	P. Charoenchai	22 Sep. 97	KYN
Toona ciliata M. Roem	Meliaceae	A. Boonkongchart 212	12 Apr. 03	Q. 3710 #089
Triadica cochinchinensis Lour.	Euphorbiaceae	A. Boonkongchart 125	18 Jun. 02	KYN, 775 m.
Trichospermum javanicum Bl.	Tiliaceae	S. Julbunyasit 4	24 Jan. 03	Hala-Bala
Uvaria lurida J.D. Hooker & Thomson	Annonaceae	A. Boonkongchart 23	15 Oct. 00	*U. hirsuta*Jack, KYN
Uvaria lurida J.D. Hooker & Thomson	Annonaceae	P. Charoenchai	23 Oct. 97	*U. hirsuta* Jack, KYN, ลูกสีแดงขาว
Ziziphus attopensis Pierre	Rhamnaceae	N. Tanthana 20	26 Mar. 02	KYN
Ziziphus attopensis Pierre	Rhamnaceae	W.Y. Brockelman	9 Apr. 02	wc122, H. Territory gibbons eating
Aglaia elaeagnoidea (A. Juss.) Bth.	Meliaceae	ST. 4	Apr. 01	KYN, from fruit
Aidia cochinchinensis Lour.	Rubiaceaea	ST. 19	Sep. 01	KYN, from gibbon feces
Chionanthus ramiflorus Roxb.	Oleaceae	ST.	Dec. 02	KYN, from gibbon feces
Cinnamomum subavenium (Miq.)	Lauraceae	ST. 65	Jan. 02	KYN, from gibbon feces
Cinnamomum subavenium (Miq.)	Lauraceae	ST. 14	Sep. 01	KYN, from gibbon feces (flower)
Unknown 8		ST.	Aug. 01	KYN, from fruit

Botanical name	Family	Collector number	Date	Notes
Unknown 13		ST.	Sep. 01	KYN, from gibbon feces
Unknown 31		ST.	Sep. 01	KYN, from gibbon feces
Unknown 43		ST.	Nov. 01	KYN, from gibbon feces
Unknown 45		ST.	1 Jan. 02	KYN, from gibbon feces
Unknown 51		ST.	Dec. 01	KYN, from gibbon feces
Unknown 59		ST.	Dec. 01	KYN, from gibbon feces
Unknown 63		ST.	Jan. 02	KYN, from gibbon feces
Unknown 65		ST.	Jan. 02	KYN, from gibbon feces
Unknown 66		ST.	Jan. 02	KYN, from gibbon feces
Unknown 69		ST.	Jan. 02	KYN, from gibbon feces
Aglaia elaeagnoidea (A. Juss.) Bth.	Meliaceae	Janya Jadejaroen 23	13 Apr. 00	KYN, feces group A gibbon
Aidia densiflora(Wall.) Masam	Rubiaceaea	Janya Jadejaroen 30	23 Jun. 00	KYN, feces group A gibbon
Alphonsea boniana Fin. & Gagnep.	Annonaceae	Janya Jadejaroen 2	24 Jul. 00	KYN, feces group A gibbon
Ampelopsis cantoniensis Pl.	Vitaceae	Janya Jadejaroen 38	17 May. 00	KYN, feces group A gibbon
Anthocephalus chinensis (Lmk.) A. Rich. ex Walp.	Rubiaceaea	Janya Jadejaroen 31	23 Jul. 00	KYN, feces group A gibbon
Aphanathe cuspidata (Bl.) Planch.	Ulmaceae	Janya Jadejaroen 36	18 Jul. 00	KYN, feces group A gibbon
Balakata baccata (Roxb.) Ess.	Euphorbiaceae	Janya Jadejaroen 17	28 Jun. 00	KYN, feces group A gibbon
Bridelia insulana Hance	Euphorbiaceae	Janya Jadejaroen 18	25 Aug. 00	KYN, feces group A gibbon
Bridelia stipularis (L.) Bl.	Euphorbiaceae	Janya Jadejaroen 19	19 Nov. 00	KYN, feces group A gibbon
Daemonoropsis jenkisiana (Griff.) Mart.	Palmae	Janya Jadejaroen 29	18 May. 00	KYN, feces group A gibbon
Daphniphyllum cambodianum Gagnep.	Daphniphyllaceae	Janya Jadejaroen 12	23 Nov. 00	KYN, feces group A gibbon
Desmos dumosus (Roxb.) Saff. var. *glabrior*Craib	Annonaceae	Janya Jadejaroen 3	26 Feb. 00	KYN, feces group A gibbon
Diplectria barbata (Bl.) Franken & Roos	Melastomataceae	Janya Jadejaroen 22	20 Jun. 00	KYN, feces group A gibbon (fruit & seeds)
Diploclisia glaucescens (Bl.) Diels	Menispermaceae	Janya Jadejaroen 25	17 May. 00	KYN, feces group A gibbon
Elaeagnus conferta Roxb.	Elaeocarpaceae	Janya Jadejaroen 13	24 Jan. 00	KYN, feces group A gibbon
Elaeocarpus sp. 1	Elaeocarpaceae	Janya Jadejaroen 14	28 Jan. 00	KYN, feces group A gibbon
Elaeocarpus sp. 2	Elaeocarpaceae	Janya Jadejaroen 15	18 May. 00	KYN, feces group A gibbon
Eugenia operculatus Roxb.	Myrtaceae	Janya Jadejaroen 28	16 Jun. 00	KYN, feces group A gibbon, *Cleistocalyx operculatus* Merr & Perry
Ficus sp.	Moraceae	Janya Jadejaroen 26	24 Jan. 00	KYN, feces group A gibbon
Fissistigma oblongum (Craib) Merrill	Annonaceae	Janya Jadejaroen 4	27 Jan. 00	KYN, feces group A gibbon, *F.* aff. *rubinosum* (A. DC.) Merr.
Garcinia benthamii Pierre	Gutttiferae	Janya Jadejaroen 21	21 Jul. 00	KYN, feces group A gibbon
Girroniera nervosa Pl.	Umalaceae	Janya Jadejaroen 37	24 Jan. 00	KYN, feces group A gibbon
Gnetum montanum Mgf.	Gnetaceae	Janya Jadejaroen 20	16 Jun. 00	KYN, feces group A gibbon
Grewia laevigata Vahl	Tiliaceae	Janya Jadejaroen 35	18 Nov. 00	KYN, feces group A gibbon

Botanical name	Family	Collector number	Date	Notes
Ilex chevalieri Tard.	Aquifoliaceae	Janya Jadejaroen 9	18 Jul. 00	KYN, feces group A gibbon
*Knema elegans*Warb.	Myristicaceae	Janya Jadejaroen 27	28 Mar. 00	KYN, feces group A gibbon
Melodinus cambodiensis Pierre ex Spire	Apocynaceae	Janya Jadejaroen 8	28 Jan. 00	KYN, feces group A gibbon
Nephelium melliferum Gagnep.	Sapindaceae	Janya Jadejaroen 33	17 May. 00	KYN, feces group A gibbon
*Picrasma javanica*Bl.	Simaroubaceae	Janya Jadejaroen 34	24 Jan. 00	KYN, feces group A gibbon
Polyosma elongata Gedd.	Polyosmaceae (Escalloniaceae, Grossulariaceae)	Janya Jadejaroen 16	24 Nov. 00	KYN, feces group A gibbon
Salacia chinensis L.	Celastraceae	Janya Jadejaroen 11	20 Jun. 00	KYN, feces group A gibbon
Sandoricum koetjape (Burm. f.) Merr.	Meliaceae	Janya Jadejaroen 24	16 Jun. 00	KYN, feces group A gibbon
Schefflera elliptica (Bl.) Harns	Araliaceae	Janya Jadejaroen 10	24 Jan. 00	KYN, feces group A gibbon
Tetrastigma cauliflorum Merr.	Vitaceae	Janya Jadejaroen 39	21 Feb. 00	KYN, feces group A gibbon
Toddalia asiatica (L.) Lmk.	Rutaceae	Janya Jadejaroen 32	22 Jul. 00	KYN, feces group A gibbon
Uvaria fauveliana (Fin. & Gagnep.) Pierre ex Ast.	Annonaceae	Janya Jadejaroen 5	24 Aug. 00	KYN, feces group A gibbon
Uvaria lurida J.D. Hooker & Thomson	Annonaceae	Janya Jadejaroen 6	25 Oct. 00	KYN, feces group A gibbon, *U. hirsuta* Jack
Uvaria sp.	Annonaceae	Janya Jadejaroen 7	17 May. 00	KYN, feces group A gibbon
Unknown 1		Janya Jadejaroen 40	18 May. 00	KYN, feces group A gibbon
Unknown 2		Janya Jadejaroen 41	23 Jul. 00	KYN, feces group A gibbon
Unknown 3		Janya Jadejaroen 42	15 Aug. 00	KYN, feces group A gibbon

Table 4. In Situ germination data

From gibbon's feces

No.	Species	Coll. Date	Source	No. Seeds	No. Germ.	%	Dormancy	Plant. date	Germ. Date
1	Choerospondias axillaris	27-Sep-02	Gibbon	25	5	20	55-80	3-Oct-02	28-Nov-02-12-Nov-03
2	Uvaria hirsuta	27-Sep-02	Gibbon	65	51	78	50-75	3-Oct-02	26-Nov-02-27-Nov-03
3	Eleacarpus robustus	26-Sep-02	Gibbon	4	1	25	167-190	3-Oct-02	7-Jan-02-27-May-03
4	Gacinia benthamii	26-Sep-02	Gibbon	4	4	100	169-230	3-Oct-02	19-Mar-03
5	Antocephalus chinensis	25-Sep-02	Gibbon	100	0	0	0	3-Oct-02	
6	Grewia acuminata	22-Nov-02	Gibbon	100	32	32	193-215	25-Nov-02	7-May-03-16-Jul-03
7	Aphanathe cuspidata	26,27-Sep-02	Gibbon	100	50	50	50-75	3-Oct-02	25-Nov-02-13-May-03

From tree

No.	Species	Coll. Date	Source	No. Seeds	No. Germ.	%	Dormancy	Plant. date	Germ. Date
1	Polyalthia aff.evecta	28-Sep-02	Q.1721	100	40	40	113-180	3-Oct-02	23-Feb-03-26-Jul-03
2	Canarium euphyllum	24-Sep-02	4020 365	50	26	52	90-120	3-Oct-02	3-Jan-03-13-Jun-03
3	Diospyros glandulosa	20-Sep-02	3624 388	100	19	19	165-180	25-Sep-02	11-Mar-03-3-Apr-03
4	Sloanea sigun	27-Sep-02	Q.3308	40	25	62	80-110	3-Oct-02	17-Nov-02-25-Mar-03
5	Gacinia benthamii	24-Sep-02	2311 040	100	72	72	167-270	3-Oct-02	19-Mar-03-18-Jun-03
6	Platea latifolia	28-Sep-02	3504 437	50	39	78	148-170	3-Oct-02	1-Mar-03-16-Jun-03
7	Pouteria stllibacca	14-Sep-02	Klongsai	33	5	15	167-185	25-Sep-02	4-17-Mar-03
8	Aphanathe cuspidata	27-Sep-02	2808 321	100	31	31	58-80	3-Oct-02	7-Jan-03-25-May-03

Table 5. Ex Situ germination data

From gibbon's feces

No.	Species	Coll. Date	Source	No. of SS	No. of GS	%	DP(day)	Plant. date	Germ. Date
1	Choerospondias axillaris	26,27-Sep-02	Gibbon	25	20	80	30-60	2-Oct-02	23-Oct-02-18-Dec-02
2	Alphonsea boniana	2-Jul-03	Gibbon	10	1	10	180-200	3-Jul-03	30-Nov-03
3	Desmos dumosus	17-Dec-02	Gibbon	50	8	16	50-70	20-Jan-03	2-26-Mar-03
4	Miliusa lineata	2-Jul-03	Gibbon	10	0	0	0	3-Jul-03	
5	Platymitra macrocarpa	17-Dec-02	Gibbon	3	0	0	0	19-Dec-02	
6	Uvaria cordata	18-Dec-02	Gibbon	65	21	32	45-70	19-Dec-02	10-Feb-03
7	Eleaocarpus griffithii	19-Aug-02	Gibbon	20	8	40	60-80	2-Oct-02	1-Dec-02-15-Jan-03
8	Gacinia benthamii	26-Aug-02	Gibbon	4	4	100	270-280	2-Sep-02	20-Apr-03-1-May-03
9	Diplectria barbata	9-Apr-02	Gibbon	50	0	0	0	11-Apr-02	
10	Knema elegans	8-Apr-03	Gibbon	14	12	86	30-50	11-Apr-03	24-Jul-03-30-Jul-03
11	Ziziphus attopensis	9-Apr-03	Gibbon	50	50	100	30-45	12-Apr-03	27-Apr-03-10-May-03
12	Prunus javanica	8-10-Apr-03	Gibbon	50	26	52	30-45	12-Apr-03	1-9-May-03
13	Aidia densiflolia	25-Sep-02	Gibbon	100	0	0	0	2-Oct-02	
14	Grewia acuminata	26-Nov-02	Gibbon	100	42	42	25-30	29-Nov-02	20-Dec-02-4-Jan-03
15	Aphanathe cuspidata	26-Sep-02	Gibbon	100	39	39	30-45	1-Oct-02	16-Nov-02-15-Dec-02
16	Tetrastigma laoticum	18-Oct-02	Gibbon	10	6	60	40-65	19-Oct-02	27-30-Dec-02

From tree

No.	Species	Coll. Date	Source	No. of SS	No. of GS	%	DP(day)	Plant. date	Germ. Date
1	Choerospondias axillaris	1-Nov-02	4511 158	10	0	0	0	3-Nov-02	
2	Platymitra macrocarpa	17-Aug-03	3108 168	10	2	20	180-200	19-Aug-03	5-Nov-03
3	Polyalthia aff.evecta	27-Sep-02	Q.1721	100	9	9	120-150	30-Sep-02	30-Jan-03-23-Feb-03
4	Canarium euphyllum	27-Sep-02	4020 365	100	55	55	50-70	29-Sep-02	16-Nov-02-6-Dec-02
5	Bhesa robusta	10-Apr-03	2311 049	50	8	16	30-50	11-Apr-03	17-May-03-6-Jun-03
6	Diospyros glandulosa	27-Sep-02	3624 388	100	50	50	60-70	29-Sep-02	31-Oct-02-3-Dec-02
7	Elaeocarpus robustus	27-Sep-02	4307 084	10	0	0	0	28-Sep-02	
8	Sloanea sigun	26-Sep-02	3206 010	40	9	23	35-45	2-Oct-02	9-Nov-02-20-Nov-02
9	Balakata baccata	20-May-03	2924 376	50	0	0	0	21-May-03	
10	Bridelia retusa	10-Apr-03	2113 081	50	46	92	30-40	11-Apr-03	25-Apr-03-16-May-03
11	Mallotus paniculatus	1-Apr-03	1825 391	50	3	6	50-70	4-Apr-03	9-20-May-03
12	Gacinia benthamii	24-Sep-02	2311 040	50	15	30	240-300	30-Sep-02	10-Apr-03-12-May-03
13	Apodytes dimidiata	10-Sep-03	3202 495	100	0	0	0	16-Sep-03	
14	Platea latifolia	25-Sep-03	3208 046	50	37	74	100-150	30-Sep-03	15-24-Oct-03
15	Beilschmiedia aff. intermedia	4-Apr-03	4005 028	50	48	96	35-50	7-Apr-03	9-27-May-03
16	Beilschmiedia maingayi	4-Apr-03	3504 444	50	45	90	32	7-Apr-03	25-Apr-03-9-May-03
17	Aglaia elaeagnoidea	4-Apr-03	Q 3907	50	25	50	30-45	7-Apr-03	3-17-May-03
18	Aglaia lawii	10-May-03	4003 518	10	9	90	30-50	19-May-03	12-30-Jun03
19	Aglaia odoratissima	10-May-03	OP	35	10	29	25-40	19-May-03	8-20-Jun-03
20	Dysoxylum cyrtobortyum	26-Apr-03	4511 167	50	49	98	30-45	28-Apr-03	26-May-03-3-Jun-03
21	Antiaris toxicaria	8-Mar-03	OP	15	13	87	35-60	10-Mar-03	6-Apr-03-25-Apr-03
22	Syzygium syzygioides	4-Apr-03	3002 471	50	40	80	25-35	7-Apr-03	9-25-May-03
23	Piper ribesoides	9-Apr-03	Q.3711	50	0	0	0	11-Apr-03	
24	Podocarpus neriifolius	1-Aug-03	2308 290	50	8	16	40-55	10-Aug-03	2-18-Sep-03
25	Lepisanthes tetraphylla	16-May-03	OP	50	12	24	35-50	19-May-03	27-Jun-03-9-Jul-03
26	Palaquium garrettii	4-Apr-03	2311 058	3	0	0	0	7-Apr-03	
27	Pouteria stellibacca	15-Sep-02	Klongsai	100	41	41	30-45	16-Sep-02	27-Nov-02-20-Dec-02
28	Sterculia guttata	18-Oct-03	3012 056	50	25	50	30-40	20-Oct-03	2-15-Nov-03
29	Symplocos cochinchinensis	18-Aug-03	4212 168	50	39	78	25-40	19-Aug-03	5-19-Sep-03
30	Aphanathe cuspidata	30-Sep-02	2808 321	100	10	10	30-55	2-Oct-02	1-Nov-02-9-Dec-02

*OP= outside plot(wang jum pee)

Table 6. *Choerospondias axillaris* tree visitation and seed defecation by month for group A in 2003

Month	No. tree visits	No. trees visited	No. stools collected	No. stools positive	% positive stools	Total no. seeds	Seeds per pos. stool
July	17	14	36	19	52.78	41	2.16
Aug.	7	6	43	10	23.26	12	1.20
Sept.	18	13	34	26	76.47	136	5.23
Oct.	20	15	57	43	75.44	148	3.44
Nov.	29	14	34	32	94.12	89	2.78
Dec.	0	0	44	1	2.30	1	1
All months	91	31	248	131	52.82	427	3.26

14 trees visited more than once
17 trees visited once

Table 7. Defecations of seeds of *Choerospondias axillaris* by date and tree on the Mo Singto Plot, 2003

#	Date	Time	Quad.	Tree id.	Ca seeds
1	24-Jul-03	9:56	2317	23160	1
2	26-Jul-03	7:30	2505	25223	3
3	26-Jul-03	8:36	3202	32480	3
4	26-Jul-03	10:37	3516	35194	2
5	27-Jul-03	9:15	3406	34004	1
6	27-Jul-03	9:39	3202	32490	1
7	28-Jul-03	5:58	4115	14244	1
8	28-Jul-03	7:03	2313	23107	3
9	28-Jul-03	8:10	2605	26212	6
10	28-Jul-03	10:13	3505	35213	1
11	28-Jul-03	10:43	3508	35050	2
12	28-Jul-03	13:46	3422	34351	1
13	24-Jul-03	8:24	2316	23138	1
14	24-Jul-03	11:24	2416	24170	2
15	25-Jul-03	7:35	2903	29505	1
16	26-Jul-03	6:24	2210	22014	2
17	26-Jul-03	14:17	2318	23204	1
18	28-Jul-03	7:39	2113	21081	7
19	28-Jul-03	9:18	2903	29503	2
20					Ca
21	27-Aug-03	5:47	3304	33492	2
22	27-Aug-03	6:05	3304	33483	1
23	28-Aug-03	5:35	2517	25195	1
24	28-Aug-03	8:33	3017	30223	1
25	28-Aug-03	9:51	4407	44079	1
26	30-Aug-03	6:38	3906	39059	1
27	30-Aug-03	7:06	4308	43096	2
28	28-Aug-03	13:38	3113	31064	1
29	28-Aug-03	13:40	3113	31065	1
30	30-Aug-03	6:33	3504	35436	1
31	Day	Time	Quad	Treeid	Ca
32	23sept03	6:15	2313	23106	5
33	23sept03	12:01	4320	43369	3
34	24sept03	6:05	3319	33304	3
35	24sept03	9:15	2215	22123	1
36	24sept03	11:11	2316	23142	6
37	24sept03	12:05	2418	24196	1
38	25sept03	6:11	2614	26122	2
39	25sept03	6:49	2313	23105	13
40	25sept03	7:55	2916	29142	4
41	25sept03	8:35	3317	33246	1
42	25sept03	13:30	3204	32445	4
43	26sept03	10:11	2213	22100	2
44	26sept03	11:20	2809	28330	2
45	26sept03	14:02	4010	40115	2
46	27sept03	5:52	4315	43256	11
47	27sept03	6:01	4512	45184	10
48	27sept03	11:57	3319	33304	2

49	23sept03	8:43	3507	35030	10
50	27sept03	7:30	3903	39515	4
51	27sept03	7:34	3701	37447	2
52	27sept03	13:53	3911	39171	1
53	23sept03	11:56	4319	43356	10
54	26sept03	7:11	4206	42087	18
55	26sept03	7:47	4410	44134	4
56	23sept03	10:39	4318	43304	14
57	26sept03	12:52	4009	40102	1
58					Ca
59	4oct03	8:55	2924	29381	1
60	4oct03	12:03	3906	39059	1
61	5oct03	5:40	2612	26065	11
62	5oct03	5:48	2214	22113	7
63	5oct03	8:31	2809	28323	2
64	5oct03	9:18	4415	44254	1
65	5oct03	12:42	3514	35160	2
66	6oct03	5:52	2515	25129	6
67	6oct03	8:37	2908	29233	3
68	6oct03	10:31	3701	37447	6
69	6oct03	13:17	3302	33536	11
70	7oct03	6:09	3009	30202	3
71	7oct03	7:02	2809	28331	4
72	7oct03	9:33	2213	22100	7
73	8oct03	6:28	2908	29231	2
74	8oct03	9:30	2214	22113	4
75	8oct03	12:46	2313	23106	7
76	9oct03	7:04	2312	23082	7
77	9oct03	8:09	2909	29241	5
78	9oct03	11:59	4411	44160	6
79	4oct03	5:54	4214	42249	2
80	4oct03	6:08	3715	37193	6
81	4oct03	9:31	3124	31357	2
82	5oct03	13:52	3218	32252	3
83	8oct03	8:07	2510	25001	7
84	9oct03	6:14	2214	22113	2
85	9oct03	8:55	3811	38128	12
86	6oct03	7:33	2113	21081	2
87	8oct03	6:30	2808	28321	4
88	9oct03	11:14	4414	44237	4
89	9oct03	14:04	3305	33209	2
90	8oct03	5:51	4005	40023	1
91	9oct03	10:40	4415	44248	5
92					Ca
93	15nov03	10:12	3318	33266	2
94	15nov03	12:39	3512	35110	1
95	16nov0303	6:29	3712	37126	1
96	17nov03	5:57	3218	32248	1
97	17nov03	8:34	3611	36110	1
98	17nov03	9:51	2802	28554	1
99	17nov03	13:55	3509	35064	5
100	17nov0303	5:57	3218	32253	4

101	17nov0303	8:11	3420	34280	4
102	18nov03	7:11	2704	27476	3
103	18nov03	7:31	2504	25489	4
104	18nov03	10:20	3112	31047	3
105	19nov03	8:03	3512	35106	2
106	19nov03	9:22	2704	27480	2
107	19nov03	10:48	2716	27181	3
108	19nov03	12:37	3720	37282	2
109	20nov03	6:56	4116	41271	6
110	20nov03	11:44	3515	35173	5
111	16nov0303	11:01	2113	21081	2
112	18nov03	9:14	2911	29036	7
113	18nov03	12:44	3715	37190	2
114	20nov03	6:23	4115	41252	3
115	20nov03	8:17	4212	42207	2
116	20nov03	9:22	3701	37447	5
117	16nov0303	5:15	3712	37130	2
118	16nov0303	8:18	2603	26516	2
119	17nov0303	6:38	3523	35356	2
120	20nov03	11:19	3208	32046	2
121	20nov03	12:53	3523	35365	4
122	20nov03	13:00	3622	36357	4
123	17nov0303	13:31	3611	36112	1
124	18nov03	5:55	3305	33209	1
125	Day	Time	Quad	Treeid	Ca
126	7dec03	11:29	2818	28256	1

Table 8. Animal observation at a large *Aphananthe cuspidata* tree in 2003

Date	Duration	Animal	Fruits	# animal
20-Aug-03	18:00-24:00			0
21-Aug-03	24:01-6:00			0
21-Aug-03	6:01-12:00	Giant squirral	feed	1
21-Aug-03	6:01-12:00	Maccaca nemestrina	no feed	1
21-Aug-03	6:01-12:00	Gibbon	no feed	1
21-Aug-03	6:01-12:00	Oriental pied hornbill	feed	1
21-Aug-03	6:01-12:00	Oriental pied hornbill	no feed	2
21-Aug-03	6:01-12:00	Megalaima lineata	feed	2
21-Aug-03	12:01-18:00			0
9-Sep-03	12:01-18:00	Megalaima lineata	feed	2
9-Sep-03	18:01-24:00			0
10-Sep-03	24:01-6:00			0
10-Sep-03	6:01-12:00	Squirral	feed	1
10-Sep-03	6:01-12:00	Anthracceros allbirostris	feed	2
10-Sep-03	6:01-12:00	Giant squirral	feed	4
10-Sep-03	6:01-12:00	Megalaima lineata	feed	4

Figure 1. All trees (approximately 17,000) over 10 cm in diameter on the Mo Singto plot. Larger trees are shown with larger dots.

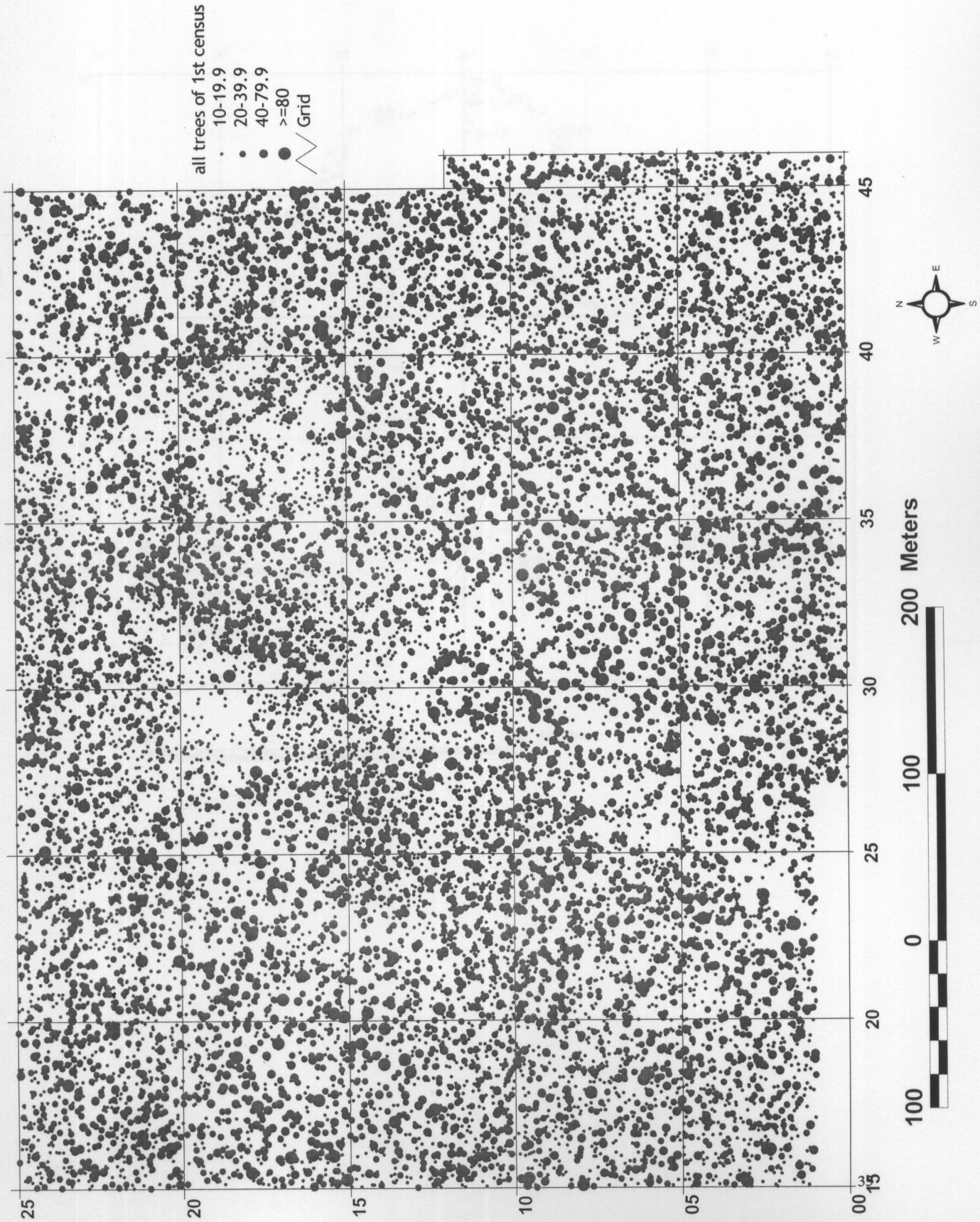

Figure 2. Ranging path of the female group A on 4 October 2003. Tree No. 1 on the right side was the sleeping tree, in which she woke up at 0550 h, and began traveling west to feed in fruit trees at 0606 h and 0625 h. Solid green dots represent trees used only for traveling. The group often traveled straight to major fruit sources without stopping for other activities (e.g. to a large fig tree in the southeast corner which they reached at 1117 h). The female went to sleep at 1425 h in tree no. 332 recorded (many trees passed through briefly were not recorded).

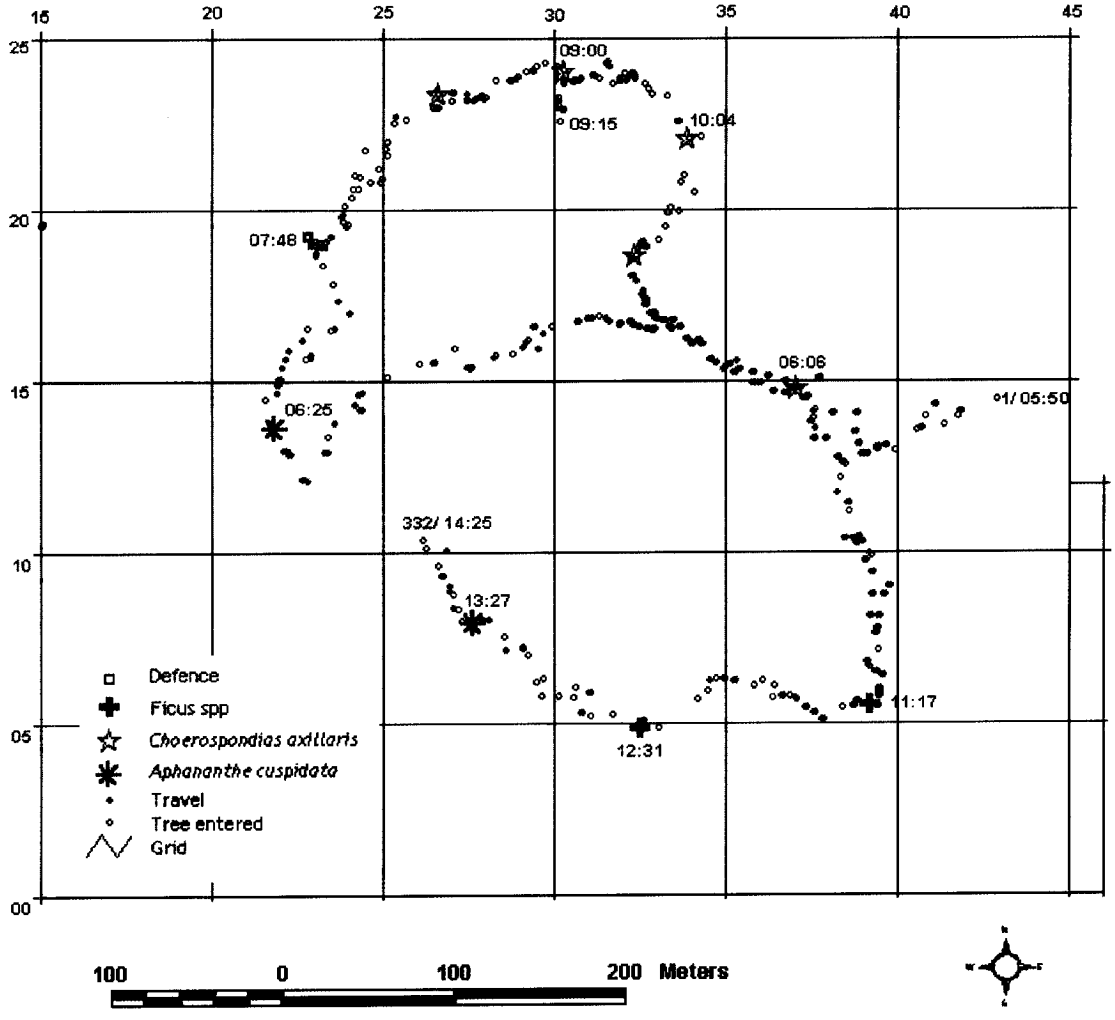

Figure 3. Ranging paths of group A during 6 days in November of 2003. Note that the gibbons use the same "pathways" through the trees on different days.

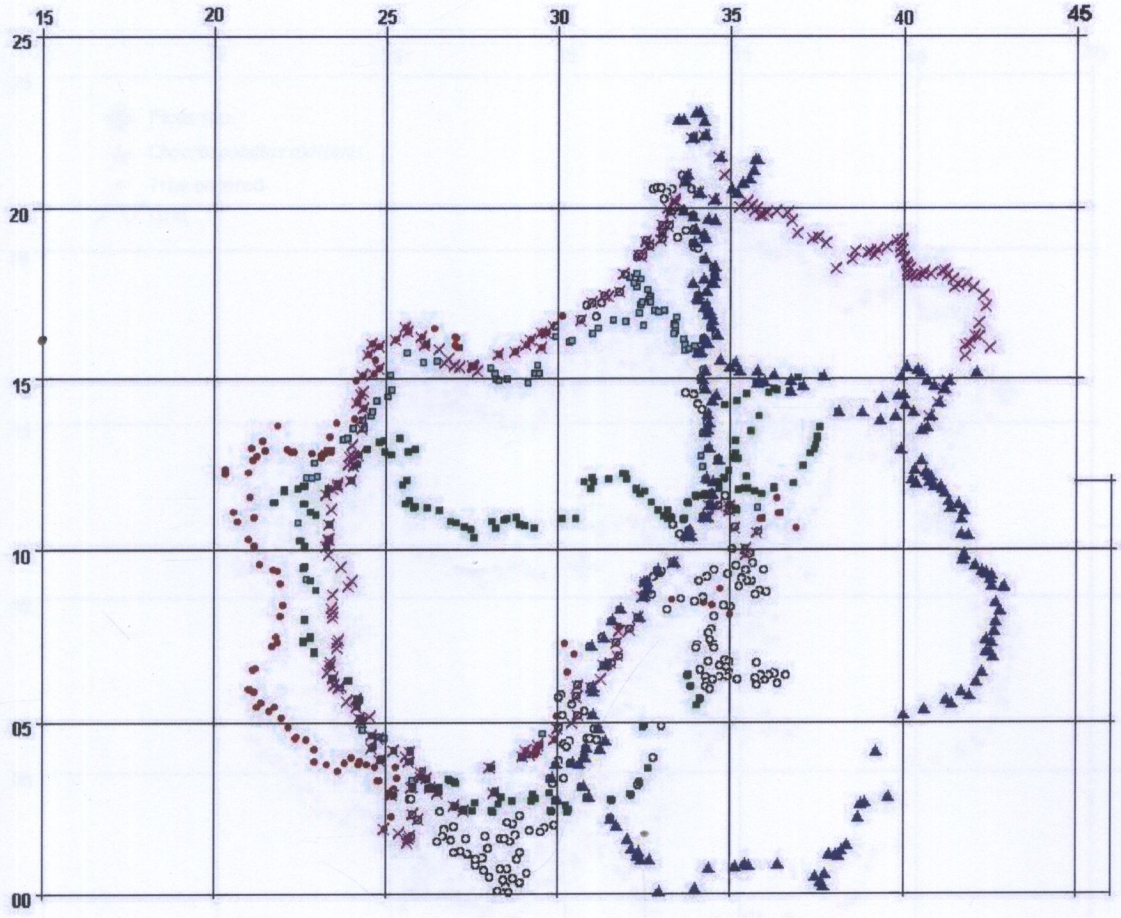

Figure 4. Ranging paths of group A during 6 days in November of 2003, showing the major fruit trees visited. Fig trees are shown as green crosses, and *Choerospondias axillaris* trees are shown as red stars. The group repeatedly visited the same trees on different days.

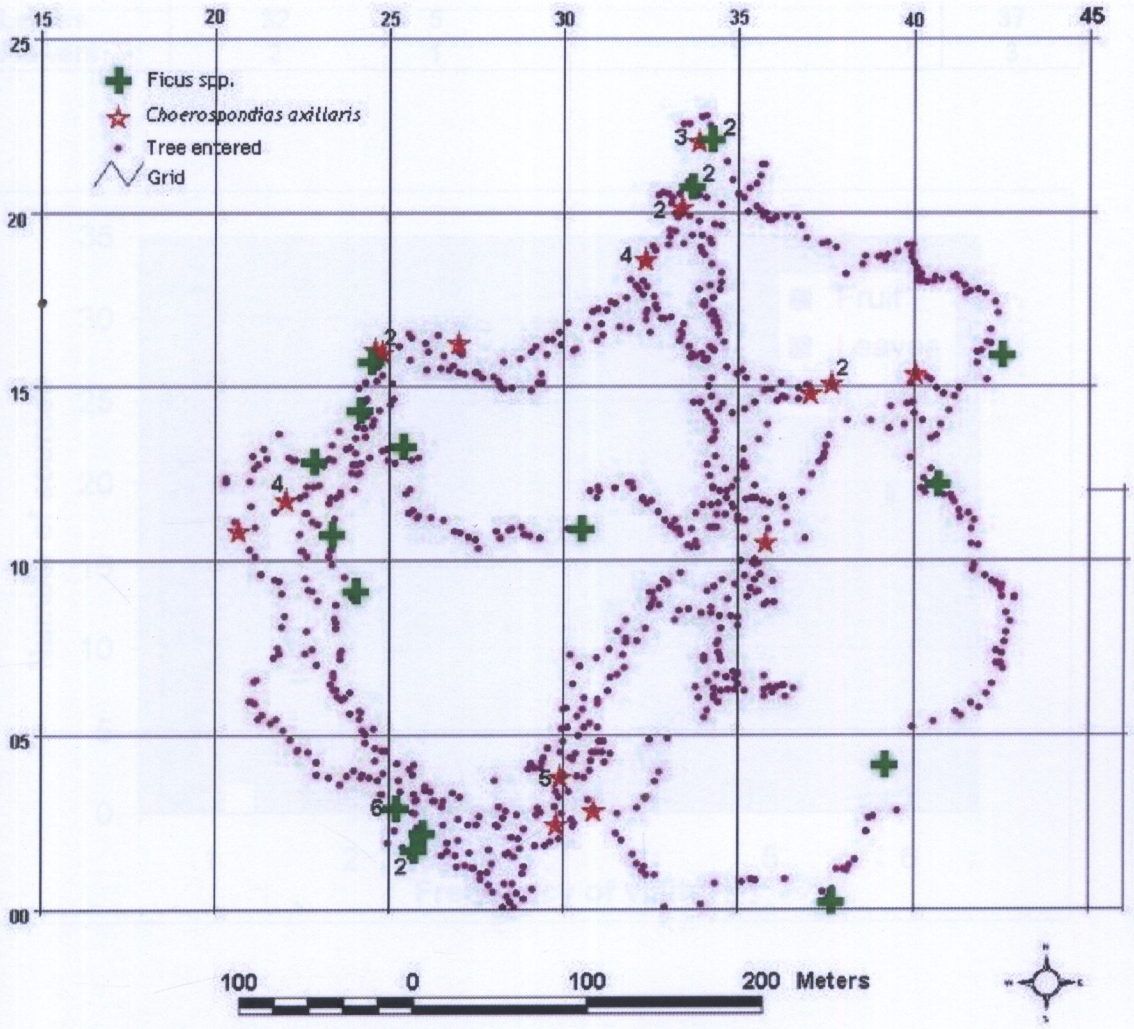

Figure 5. Frequency distribution of number of visits to food sources, November 15-20, 2003

	Number of visits per source						Total no. of sources
Source type:	1	2	3	4	5	6	
Fruit	26	5	1	2	2	1	37
Leaves	32	5					37
Flowers	2	1					3

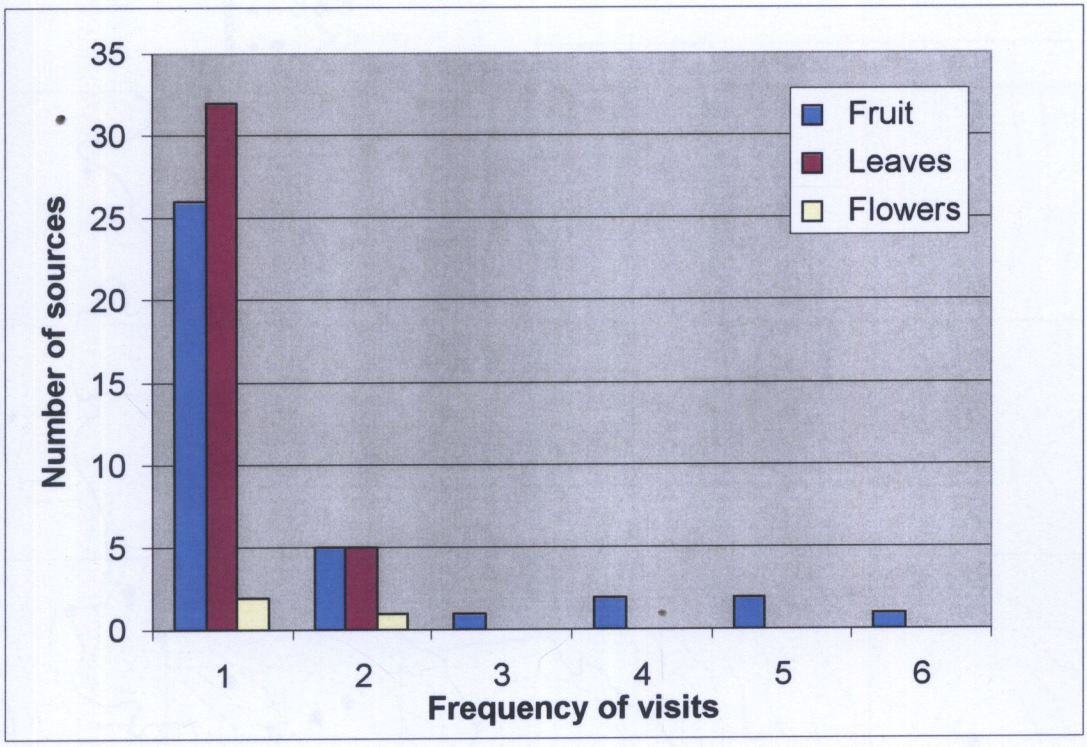

Figure 6. Distribution of *Choerospondias axillaris* trees ≥20 cm dbh on the Mo Singto plot that fruited in 2003 as determined by the presence of seeds on the ground in December. Large dots represent heavy fruiters (>10 seeds/m^2) and small dots represent light fruiters (<10 seeds/m^2).

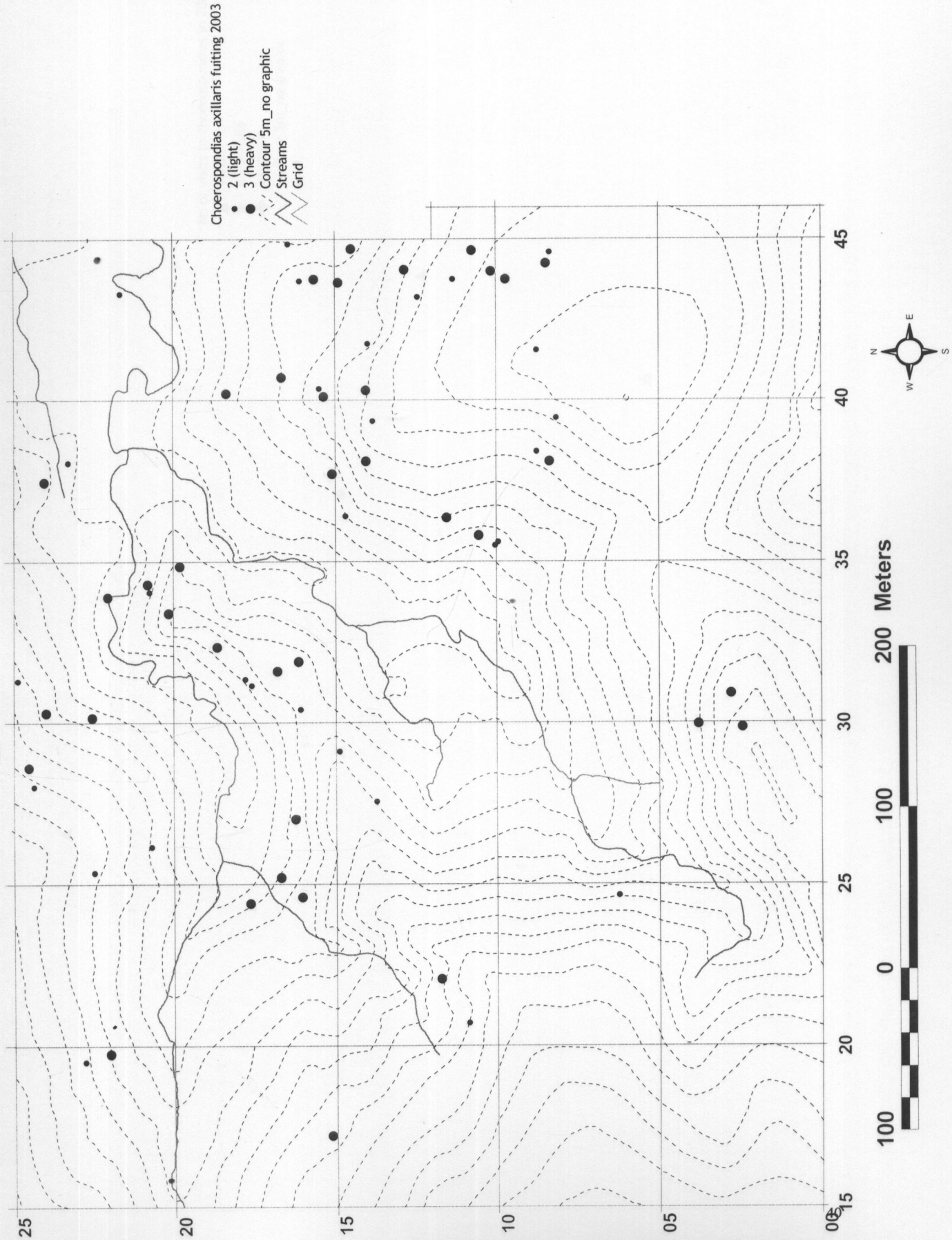

Figure 7. *Choerospondias axillaris* trees used by gibbons of group A on the Mo Singto Plot during study of foraging behavior in July to November, 2003.

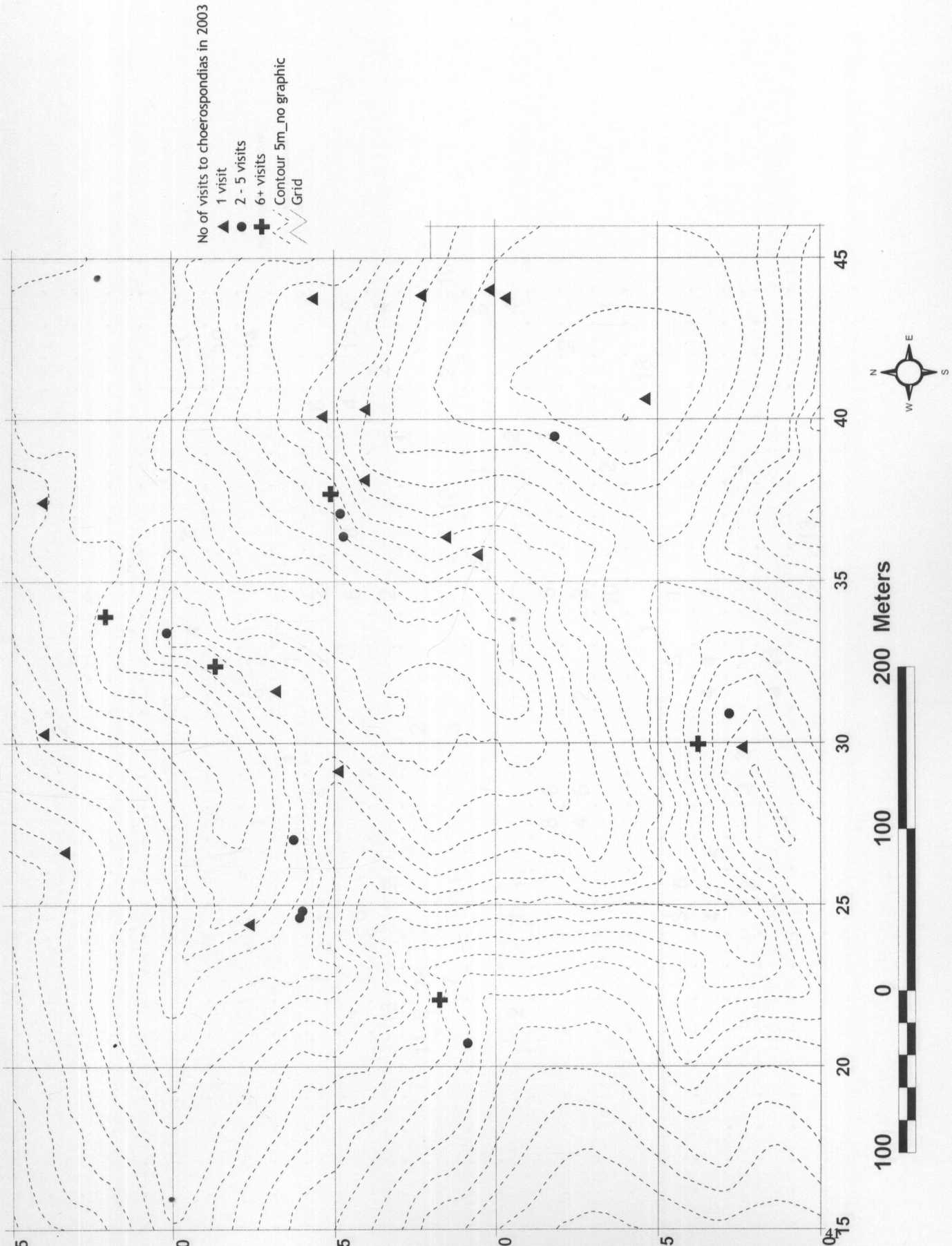

Figure 8. Number of seeds dropped in feces in quadrats on the Mo Singto Plot by group A gibbons while being followed in 2003.

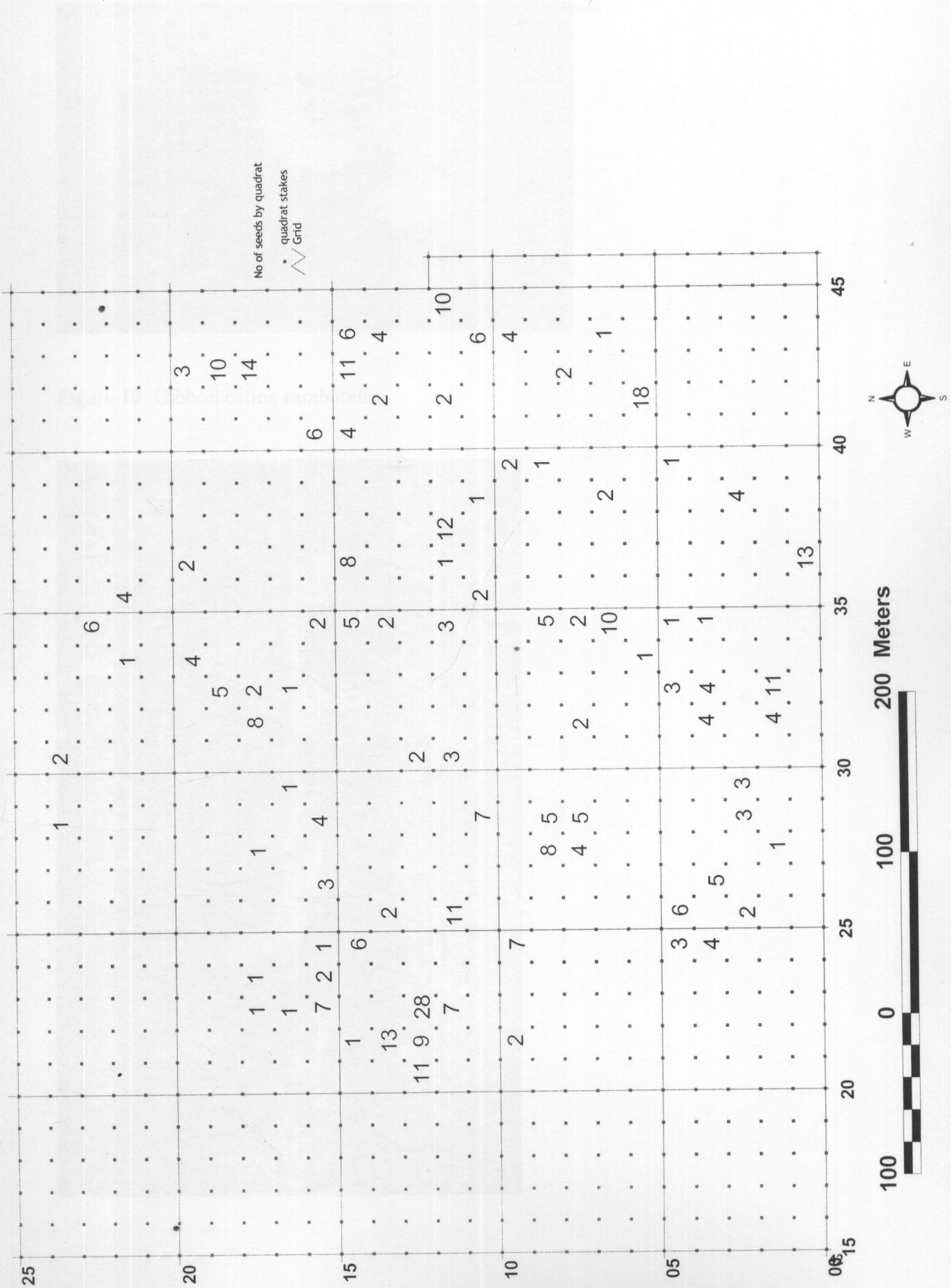

Figure 9. Rambutan fruits

Figure 10. Gibbon eating rambutans

Figure 11, 12. Rambutan fruits in trap

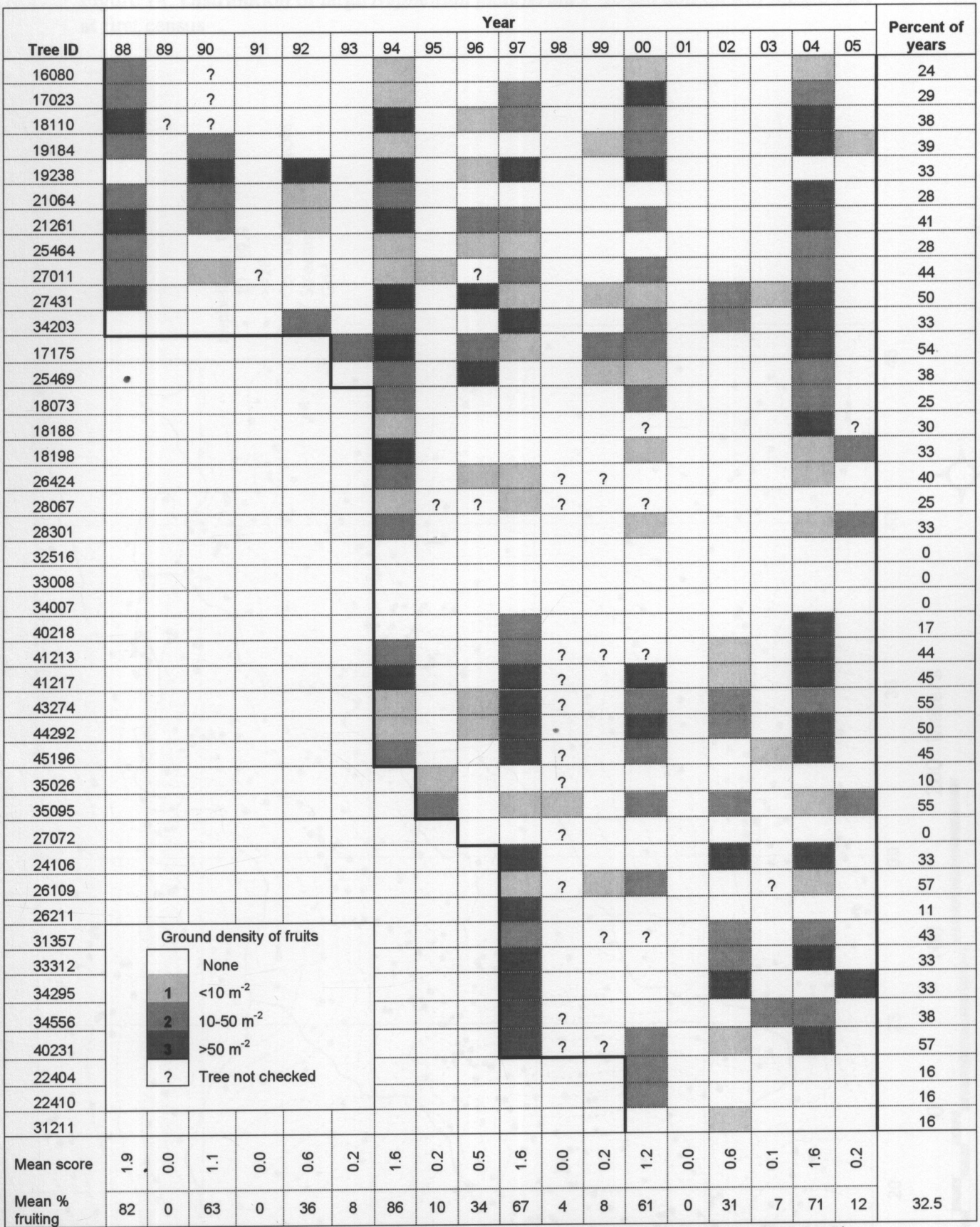

Figure 13. Fruiting record of 42 *Nephelium melliferum* trees observed on the Mo Singto plot for at least 6 years since 1988. The intensity of fruiting was measured by the density of husks or fruits on the ground under the canopy.

Figure 14. Distribution of large *Nephelium melliferum* > 10 cm dbh on Mo Singto Plot at first census

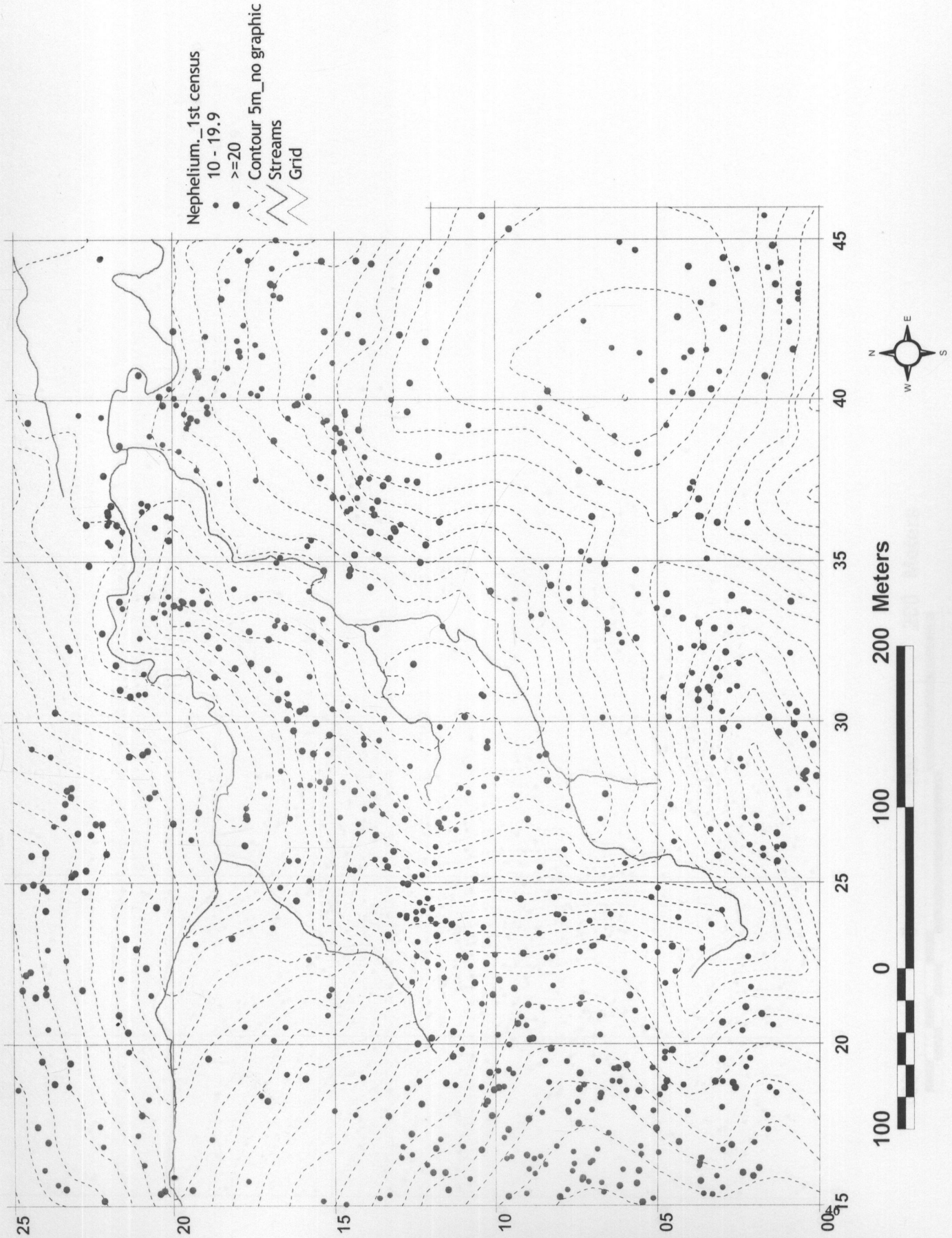

Figure 15. Distribution of small *Nephelium melliferum* trees 1-10 cm dbh at second census

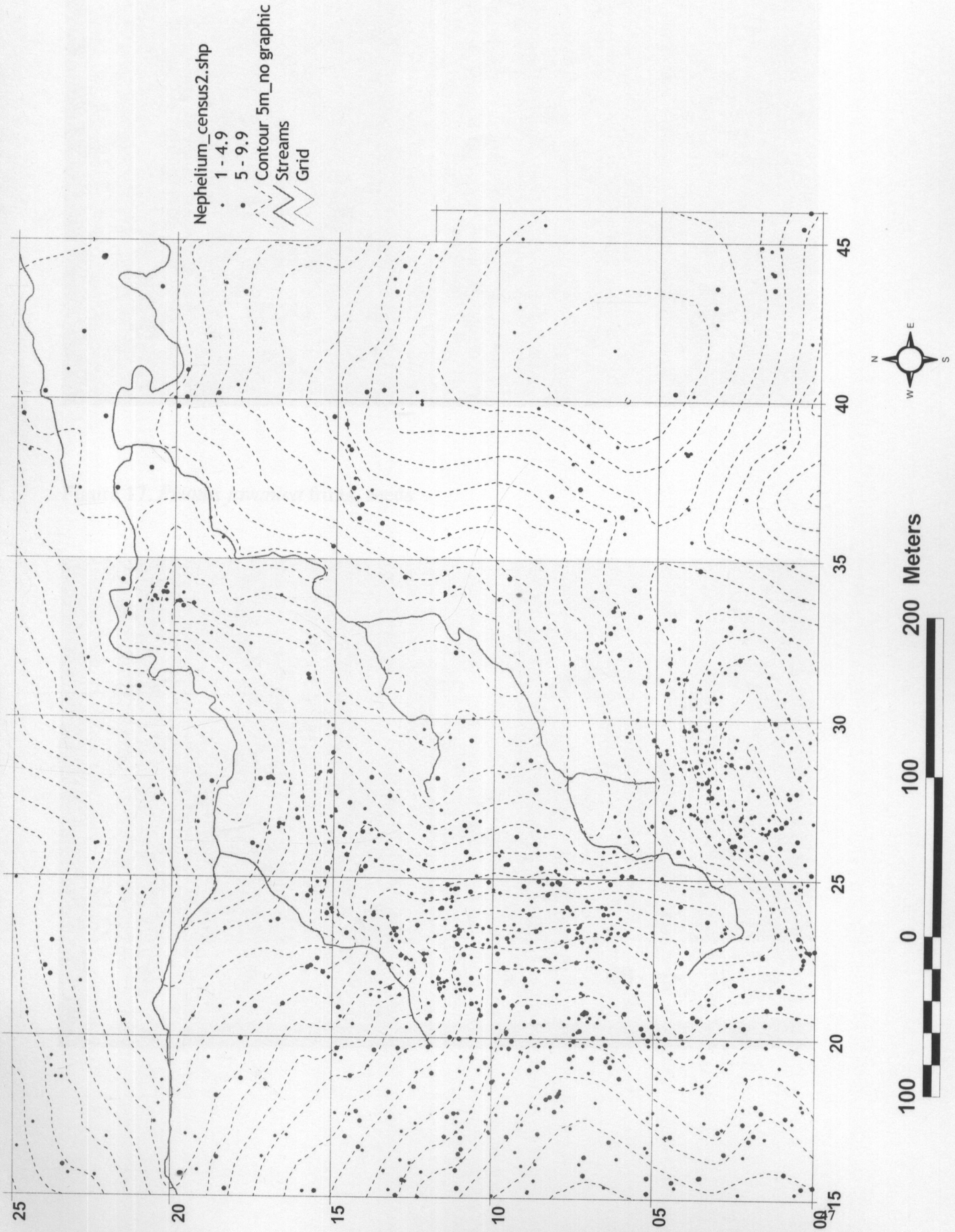

Figure 16. *Nephelium melliferum* seedling

Figure 17. *Prunus javanica* fruits, seeds

Figure 18. *Prunus javanica* seeds in bear scat

Figure 19. *Prunus javanica* seedlings in old log