ORANG-UTAN DATA COLLECTION STANDARDISATION

(Designed during Orang-utan Culture Workshop, February 2002, San Anselmo ,USA)

Chaired and edited by Helen Morrogh-Bernard, Simon Husson and Claire McLardy

Why standardise

- Minimum standardisation of field data collection methods to allow comparison of behavioural and ecological variables between sites.
- Provide an 'ideal' protocol for new sites.
- Papers/reports should acknowledge use of standardised techniques to facilitate accurate comparison of data reported by different authors.

METHODS STANDARDISATION

Variables to be recorded for comparison between sites are given in red type. All variables to be presented by calculating mean per individual. Individual's means are then averaged to give the mean for each age/sex class, and then the mean for each age/sex class is averaged to give the overall mean for each study. Monthly estimates should be presented to highlight seasonal effects.

NB: Where you have 'mean' you should also add 'median' and 'range'. For some parameters median is more appropriate and range gives a sense of the range of variation.

All definitions required for analysis of these variables are given in *italics*.

Editorial comments and requests for further discussion are given in green type.

1. ACTIVE PERIOD

Start of daily active period: Defined as the time of day when animal first sits up at the edge of the nest (or performs a behaviour other than reclining).

Start of daily active period (minutes)

End of daily active period: Defined as the time of day when animal reclines in the nest and performs no other observed behaviours.

NB: Further activities may be suspected, i.e. swaying of nest possibly owing to mother-infant play, but if the behaviour cannot be observed/confirmed the above definition should still be used.

End of daily active period (minutes)

Active period: Defined as the length of time in minutes between the start of daily activity and end of daily activity.

Length of active period (minutes)

Observation minutes: *Defined as the time of initiating data collection on the focal animal or arrival at the nest to the time of termination of data collection or leaving the nest. This number, thus, may include minutes when the animal is sleeping before awakening in the morning or going to sleep at night.*

Observation time (minutes)

NB : Most GPS give time of sunset and sunrise at local position. Where this information can be recorded, start and end of daily active period should also be recorded as minutes after sunrise, and end of daily activity recorded as minutes before or after sunset. This will avoid discrepancies in time-zones between sites.

2. ACTIVITIES

Primary activities given in <u>CAPITALS & UNDERLINED</u>. These activities are exclusive and should add up to 100%. In case of doubt, i.e. into which primary activity the observed behaviour should be placed, priority is given in the order they appear in this document.

(i) <u>FORAGING</u>

NB: Foraging is separated into *Feeding*, *Food Search* and *Tool Preparation* activities – these can be combined later as foraging for comparison between sites if necessary. This separation is made as feeding implies actively consuming calories, whereas searching for food or preparing a tool doesn't.

<u>Feeding</u>   *Any type of feeding behaviour in which the animal is actively eating, reaching for food, processing or preparing food items. Includes travelling within a patch, drinking and tool use.*

<u>Food Search</u>   *Searching for food, such as termites or other animals while not actively engaged in feeding.*

<u>Tool Preparation</u>   *Selecting, preparing and modifying tool while not actively engaged in feeding. Describe kind of tool for 'cultural' comparisons.*

Feeding time (expressed in minutes/day and also as % of active period)

Food search time (expressed in minutes/day and also as % of active period)

(ii) <u>NEST BUILDING</u>:

Actively making a new nest or rebuilding old nest.

Rebuilt nest*: Defined as old nest that has foliage added to it*

Reused nest*: Defined as old nest that is used as found (includes nests that may have been actively worked on but without new foliage added, i.e. original foliage may have been rearranged).*

Record:
- day or night nest.
- tree height and DBH.

- nest height.
- tree species nest built in (if known).
- position of nest: (*top; "V"; end of branch; more than one tree (record how many); on ground*). Diagrams to be produced.
- nest size (diameter).
- number of supporting branches used to build nest.

Number of new nests built per day (excludes re-built and re-used nests; record day-nests and night-nests separately)

Nest rebuilding rate (% of all nests used)
Nest reutilization rate (%of all nests used)

NB: The above definitions are very important for nest census analysis. The value '*r*' in the nest census methodology is the number of new nests built per day.

In addition, it would be extremely useful if a sample of nests for which the day of initial construction is known (e.g. it was built during a focal follow) can be monitored to final disappearance. A minimum sample size of 50 night nests and 50 day nests is recommended. This can be then used to estimate the nest decay rates for a given site and provide a value for '*t*' in the nest census methodology.

The time a nest remains visible, '*t*', is calculated using the following formula:

$$t = [t_1 * (d / r)] + [t_2 * (n / r)]$$

where:

t_1 = mean time (days) from construction to disappearance for day nests
t_2 = mean time (days) from construction to disappearance for night nests
d = mean number of new day nests built per day
n = mean number of new night nests built per day
r = mean total number of new nests built per day

(iii)   AUTOPLAY:

Engaging in a behaviour alone that is judged by the observer to represent play. Can include playing with food, playing with leaves/twigs/branches.

Auto-play (expressed in minutes/day and as % of active period).

(iv)   SOCIAL BEHAVIOURS:

Interaction with another individual. Always identify the other individual. Includes several forms that are defined below.

*Mating: All activities involved in mating or attempting to mate. This can include courtship (record whether focal individual solicits), attempt to mate, struggles relating to mating and copulation (forced/unforced). For list of definitions within this activity consult Elizabeth Fox (Fox EA: The function of female mate choice in the Sumatran orang-utan (*Pongo pygmaeus abelii)*. PhD thesis, Duke University, 1998). NB There may be some categories of mating not witnessed by Fox that have been recorded elsewhere, including initial resistance by female then change to cooperative mating.* [The list to be fully reproduced with definitions when this thesis is obtained by the editors.]

Mating (expressed in minutes/day and also as % of active period)
Minutes per mating (mean number of minutes/ site)

Number of mating attempts per unit time
Number of completed matings per unit time

Long-calls: *Gives long-call. Where possible, add duration (seconds) and number of 'pulses' and 'bubbles'.*

Number of long calls made per day (during active period). Record for each individual male, then an overall mean should be generated.

Optional: Total number of long-calls heard per day, recorded from a fixed location (i.e. main camp) 24 hours per day.

Social play: *Behaviour that involves the 'play-face' expression or is judged by the observer to represent social play.*

Social play (expressed in minutes/day and % of active period)

Aggressive: *Behaviour that includes aggressive elements. Includes fighting; branch breaking and snag crashing; brief chase i.e. <1 minute; aggression towards the human observer.*

Aggressive behaviour (expressed in minutes/day and % of active period)

Submissive: *Behaviour that includes submissive elements. Includes fleeing in a brief chase i.e. <1 minute; trying to avoid rough play. Begging can also be recorded as submissive behaviour, until such time as the beggar is successful and begins feeding.*

NB: There is a characteristic vocalisation (at least in Sumatra) of a high pitched 'meep' sound that often goes hand in hand with submissive behaviours.

Submissive behaviour (expressed in minutes/day and % of active period)

Allogroom: *Actively grooming, or being groomed by, another individual.*

Allogrooming (expressed in minutes/day and % of active period)

Nursing: *Mother breast-feeding infant. Record bout length.*

Nursing (expressed in minutes/day and % of active period)

Giving Birth

Other Social Behaviours: *All other activities where there is interaction between focal animal and another non-dependent individual (see later for definition) excluding activities listed above. Includes touching.*

NB: 1. If possible use published ethograms for naming behaviour patterns and vocalizations (e.g. Rijksen, 1978; Fox, 1998) [To be included when obtained by the editors]
2. Occurrences of many of the above social behaviours and autoplay are low in Borneo. In this case occurrences/month may be deemed an appropriate measure providing total follow hours are high.

(v) TRAVELLING:

Travel to another patch or area. Includes travelling with another individual (record whether focal animal is leading or following) and prolonged pursuits (>1 minute, record whether focal animal is chasing or fleeing. Movement within feeding patch is recorded as feeding (whilst distance travelled can still be recorded).

Record linear distance travelled by focal individual.

Record type of locomotion: *treesway; clambering; brachiating; quadrupedal walking.*

Treesway*: The orang-utan uses its own weight to reach another tree:*

Clambering*: Orang-utan movement in which both hands and feet are used roughly equally.*

Brachiating*: The orang-utan is actively locomoting primarily through suspension from both hands.*

Quadrupedal Walking*: The orang-utan's weight is distributed equally on his/her hands and feet while on a horizontal substrate.*

Travel time (expressed in minutes/day and also as % of active period)

Feed / travel ratio (time spent feeding per day divided by time spent travelling per day)

(vi) RESTING:

Animal not moving and not engaged in other primary activity.

NB. If recording data continuously it may be appropriate to judge an animal as resting if it is not engaged in other primary activity for more than one minute. [This may therefore produce different results between sites recording continuous data and those using instantaneous sampling – can a solution be found?]

Record body position and substrate type: –

Body Positions: S*itting; standing; lying down; hanging; quadrupedal.*

Sitting: *The majority of the orang-utan's weight is supported on its rear end, and the upper body is in an upright position.*

Standing: *The majority of the orang-utan's weight is distributed on two legs and the animal is standing on a horizontal surface. The animal may be holding on to a branch with one or both of its hands.*

Lying Down:	*The majority of the orang-utan's weight is supported on his/her torso and the animal is in a horizontal or reclining position. Subdivided into lying on the side, lying on the stomach or lying on the back.*
Hanging:	*The majority of the orang-utan's weight is supported by suspending from one or more hand or foot. Further sub-divided by recording whether the animal is hanging from hands or feet, the number of hands or feet used and whether the animal is hanging in a vertical or horizontal position.*
Quadrupedal:	*The orang-utan's weight is distributed equally on his/her hands and feet while on a horizontal substrate.*

Substrate Types: *Branch; tree crotch; trunk; liana; ground; day nest; night nest; on mother - or a combination.*

Branch:	*The majority of the orang-utan's weight is distributed on a branch.*
Tree Crotch:	*The majority of the orang-utan's weight is distributed on a tree crotch.*
Trunk:	*The majority of the orang-utan's weight is distributed on the trunk of a tree.*
Liana:	*The majority of the orang-utan's weight is distributed on a liana.*
Ground:	*At least one of the orang-utan's feet is on the ground.*
Day Nest:	*The orang-utan is in a nest built during the course of the active period.*
Night Nest:	*The orang-utan is in the nest they spent the night in (morning) or will spend the night in (evening).*
On Mother:	*The infant orang-utan is being held or carried by its mother.*

Resting time (expressed in minutes/day and also as % of active period)

Time on the ground (expressed in minutes/day and also as % of active period)

3.   FEEDING BEHAVIOUR

FOOD ITEMS:

Principal food items:

1.   Fruit :
   - record stage of maturity (ripe; unripe mature (large but not ripe); unripe immature; all stages (note colour and softness in initial descriptions)
   - record part(s) eaten (pulp; seeds; skin)
2.   Leaves: (includes shoots, epiphytes)
3.   Pith of monocots: (e.g. rattans, pandans, liana stems)
4.   Flowers
   - record stage of maturity (bud; flower)
5.   Other vegetable (e.g. roots, orchids)

6. Cambium
7. Invertebrates
8. Honey
9. Fungi
10. Meat (vertebrates)
11. Other (inc. soil, rotten wood (describe))
12. Water

Percentage of different food types in diet (expressed as % of feeding time)

Additionally record food-type species, DBH & height of food tree and crop size (fruit only) for each patch. To record crop size, sub-sample one area, like a branch, counting all the fruit, and use this to estimate the entire crop size of the tree. Perform this estimate when the orang-utan begins eating.

Record percentage of food item eaten (especially for fruit), i.e. the individual may eat 50% of a single fruit, then drop it and continue feeding on another fruit.

For each species of food describe feeding technique, if relevant, and video tape.

PATCH RESIDENCE:

Feeding Patch: Defined as one individual food tree or liana in which the individual is feeding (if the crowns of two or more separate trees of the same food species are totally interdigitated then this is considered a single patch).

Patch residence time: Defined as total time spent within feeding patch, regardless of activity. Calculate total time feeding and patch residence separately for each food type. Patch residence ends when individual has left patch for more than one minute.

Patch residence time (minutes), calculated separately for each food type, then overall mean presented.

NB: Plotted data typically exhibits long tail, time data should thus be log transformed

FEEDING BOUT LENGTH:

Defined as length of time individual engages in continuous feeding activity (as defined earlier i.e. excluding food search) on the same food species and item. Feeding bout ends if individual changes food type or engages in another activity for more than 1 minute.

Feeding bout length (minutes)

NB: (a) Plotted data typically exhibits long tail, time data should thus be log transformed.
(b) Feeding bout length is ≤ patch residence time.

FEEDING RATE:

Number of food items/minute (small items) or Number of minutes per food item (large items)

4.   RANGING

Record location of focal individual continuously where possible and at 30 minute intervals as a minimum. GPS & GIS to be used where possible (Idrisi & MapInfo recommended; ArcInfo & ArcView may also be suitable but are expensive and can be difficult to master.) If GPS reception is poor the location within the study area should be recorded and maps of a reasonable scale used eg 1:4000 to 1:8000.

Daily travel distance
(a) Total metres travelled per day i.e. actual length of travel route
(b) Straight line distance between nests (metres) (night nest to night nest distance)

Record height of animal, to nearest metre if possible, otherwise at 5m intervals i.e. on ground, 1-5m, 6-10m etc., at each sampling interval (for instantaneous sampling, or every 5 minutes if continuous sampling). Ensure inter-observer reliability through having tree at camp with painted scale.

Range size: Still require methodology that suits comparison between sites. For the time being give minimum estimates of home range sizes and explain methods used.

Home range size (hectares)

Establish individual orang-utan presence or absence from study area on a monthly basis. Record which individuals are known to have been in the study area at least once during each month.

5.   SOCIAL VARIABLES

PARTY SIZE:

Animal is associating with another individual if that individual (associate) is within visible range of the observer (or maximum inter-animal distance is 50m) and is not a dependant. Party size is defined as the number of associates present, including the focal individual, therefore minimum party size is one. Record whether associate is offspring, mother, or other (if known give name and if not give age/sex class).

A dependent individual (i.e. infant) becomes an associate when its mother has another baby or the infant reaches 8 years of age (in cases where this is the mother's last baby).

NB: at several sites a 50m visible range is impossible on nearly every occasion. Therefore party-size should also be recorded at a 30m separation, and the distance used stated clearly when presenting mean party-size.

Estimate distance between associates at each sampling interval (for instantaneous sampling, or every 5 minutes if continuous sampling).

Mean party size per individual: $= [(\text{minutes}_1) + 2(\text{minutes}_2) \ldots\ldots + n(\text{minutes}_n)] / \text{total follow minutes}$

where:
minutes_1 = the sum of focal minutes where party size = 1;
minutes_2 = the sum of focal minutes where party size = 2; etc.
n = maximum party size recorded.

Record whether associating as part of a travel band:

Travel band defined as grouping of more than one independent individuals arriving at or leaving feeding patch together.
Note whether the associate individual has any dependents.

FOOD SHARING:

Food sharing defined as exchanging food items with another individual (record whether dependent or associate).

Record whether *active giver* (initiating exchange of food items), *passive giver* (giving food items without initiating exchange), *passive recipient, beggar, thief* or *victim of theft*. Describe each instance.

CO-FEEDING:

If another independent individual is in the same feeding patch as the focal animal.

Time co-feeding (expressed in minutes/day and also as % of feeding time)

VOCALISATIONS

Definitions of all known vocalisations to be included, starting with list from Rijksen (1978). It would be useful to try and produce a cassette/CD with vocalisations on and their 'names'. This might make a nice project for a Masters thesis, and zoos can help too.

6.   DEMOGRAPHIC VARIABLES

- *Population density* (individuals per square km) (It may also be interesting to present nest densities (nests per square km) and nest encounter rates (nests per kilometre of trail) for comparisons).
- *Adult sex ratio* (by counting number of reproductive males and females encountered over two year period within study site).
- *% of adult females with infants.*
- *% of individuals which don't make nests (used for calculating the variable* 'p' *used in the nest census methodology)*
- *Inter-birth interval* - (either long term or short term (This can be calculated with incomplete intervals using a Kaplan-Meir analysis)).
- *Record relatedness among individuals* - (long term).
- *Age at menarche.*
- *Age at first sexual behaviour.*
- *Age at first mating.*
- *Age at first birth.*
- *Number of births/female.*
- *Number of months between birth and resumption of mating.*
- *Interval between resumption of mating after a birth and the next conception or birth* (note which one is measured).

7.   PHENOLOGY

Productivity
Productivity should be measured by use of litter-fall traps, for direct comparisons with other sites.

Traps should be made from mesh, placed well above the ground, ideally be exactly 1 square metre in size, and be repaired or replaced immediately when necessary. The edges should be reinforced with metal wire or planks to keep the bottom taut and surface area constant. Contents should be emptied twice a month on first day and on the 14th, 15th, or 16th (depending on total number of days in month), separated into leaves, reproductive parts and woody parts (up to one inch in diameter, bigger branches are removed). The fractions should be oven-dried at ca. 70° C until constant weight (ca. 1 day usually) and weighed. One plot should have at least 8 traps, spaced at least 15m apart to reduce dependency; linear plots are the most effective.

Other measurements that may be useful for recording productivity:

— % of genera fruiting. Record stage of ripeness.

— % of trees with potential fruit (of fruit genera that orang-utans are known to eat).

— Monitor fallen fruit on transect.

— Crop size (count number of fruits on one branch and then extrapolate that for the whole tree).

— Soil samples for pH, phosphate and potassium content.

— Number of species and genera seen eaten.

Recommended method for new sites:
Strips of 10-20m width, 200m + in length set up in each habitat type, with every tree over 30cm CBH (GBH) or 10cm DBH tagged and identified. In addition, important low density food plants e.g. Neesia, Durian, should be monitored if they do not occur in your plots.
Presence/absence of flowers, buds, immature and mature ripe fruits and young leaves recorded, and fruit crop size (per tree) monitored.
Each route should be walked once a month, on approximately the same day each month.

NB. In forest types where DBH sizes are generally small, e.g. peat swamp forest, it is recommended that the minimum size for inclusion in plots is 7cm DBH (21cm CBH)

8. URINE AND FAECAL ANALYSIS

Several people have requested this topic be included for comparisons between sites. A brief description of proposed activities under this heading is given below. Please can each site send methodologies as appropriate.

HORMONAL ANALYSIS

Urine and/or faeces can be collected for this analysis, as per Gunung Palung study.

PARASITE ANALYSIS:

This is relatively easy and only requires a microscope, an ID book and other minor equipment. Several sites recommend a concerted study of this, and it would be very useful for the rehabilitation/reintroduction projects to have an idea of the parasite loads that wild orang-utans are carrying.

PATERNITY AND GENETIC ANALYSIS

Hair (recently shed) and, preferably, faecal samples can be collected and preserved for genetic analysis as per KOCP project in Sabah.

9.   GENERAL GUIDELINES FOR NEW SITES

<u>STUDY SITE:</u>

- The minimum size of a study site should encompass at least one female's entire home range. The area can be extended in the future to include a male home range.
- Trail systems must be cut to enable easy location within the site and easy access into and out of the forest. It is recommended that trails be tagged every 25m for easy location.
- For new study areas the Base camp itself should be set up in the middle of the proposed study area (i.e. trail system) if possible, rather than on the edges e.g. river banks etc. This will avoid edge effects and enable easier access to all parts of the study site. It will also allow the study area to be four times greater in size for little extra effort. Where rivers are needed (e.g. for water supply) efforts should be made to find locations where research can be carried out on both sides, as opposed to just one.

<u>HABITUATION:</u>

Habituation Techniques:

- Clothes should be of a consistent type and colour between researchers so the orang-utan can distinguish between researchers and others not associated with research (no bright colours should be worn. Army-style clothes may be inappropriate if the army are active in your area, although, if this is not a problem, green or camouflage clothing is preferred).
- Do not get too close to the orang-utan and beware of falling branches and faeces (be particularly cautious near large dead trees as these are sometimes pushed over by orangutans).
- Act submissively - Do not look directly at them (orang-utans feel threatened by direct staring), hide and sit down, pretend to eat leaves.
- Do not stand, this is a threatening gesture.
- Do not talk too loud.
- When leaving a night nest with the intention to follow the next day, it is advisable to wait distinctly longer than normal to ensure the animal does not move again after you have left.
- If an orang-utan is very threatening, back off and sit down, pretend to eat leaves and do not stare at them. If the threats persist and there is a threat of an attack, then it is better to leave.

Signs that animals are habituated:

- Frequency of resting behaviour, kiss squeaks, defecating and throwing of branches falls and levels out.
- Fleeing and hiding behaviour becomes uncommon.

Bark feeding (especially in notably aggressive way) as witnessed for Sumatran orang-utans, becomes average for current ecological situation.

NB. Only report behaviour data on habituated orang-utans, although data is collected from the start to determine when the animal has been habituated and how long the process takes.

INDIVIDUAL RECOGNITION:

- Checklists must be used to help in the identification of individuals, to include a detailed description of the individual including any distinguishing marks (cuts scars, missing digits, warts, size of throat sack and shape of cheek flanges, etc.). Frequently observed unique behaviours may also be appropriate. Record age/sex class (infant, juvenile, adolescent, flanged adult males, unflanged adult male, adult female) and estimated birth year if possible. Should also record common associations and the locality where normally encountered (some individuals may have range boundaries within the study area).
- Photographs or detailed drawings made. It is recommended that digital camera techniques be used. Record vocalizations if possible, as these can be used for identification between individuals. Update photographs at regular intervals.
- Provide the individual with a name; these are easier than numbers (cross check regularly that all researchers are using the same name for the same individual).

Age/Sex Class Definitions

Infant

Juvenile

Adolescent female

Adult female

Un-flanged male

Flanged male

NB: Some sites include adolescent males as a separate age-sex class (e.g. still relatively small compared to other non-flanged males, not nursing from mother, 8-12 years old.) However in practice it is difficult to distinguish between a male that is adolescent and one that is mature and unflanged, so one category is recommended in this instance.

SELECTING A FOCAL:

Generally the first individual met should be your focal animal. However, this depends on your research priorities. If the animal is not the individual you are interested in then they can be dropped. One must try and keep it as representative for each age/sex class as possible, depending on the focus of the study. To avoid bias, switching focals during follows (upon encounter of other individual) must be done only in exceptional circumstances according to a predetermined rule. It would generally be better to try and continue a follow till night and make the switch the following morning. This would normally be possible if there are two observers.

DATA COLLECTION:

Data should be collected by continuous, or instantaneous sampling, or a combination of both depending on the variable. If data is collected instantaneously, then bout lengths should be recorded separately.

Instantaneous sampling: This varies between sites, but once every 2 minutes to once every 5 minutes is recommended; this will depend on how many variables one is trying to record and whether continuous data is also being recorded.

FOLLOW LENGTH:
Minimum length will depend on what data is being reported. For reporting general activity profiles a Minimum Length of 3hours for a partial follow is recommended. However, full day follows (nest to nest) are recommended, as partial data is usually excluded from many datasets.

INDIVIDUAL FOLLOW TIMES:
It is important to get a good representation of the population (age / sex classes) at each site, with a good data set for each individual.

The minimum number of hours required and number of individuals needed will depend on the data set being collected. It is recommended that the project sets goals on the minimum number of follow days for each individual before the project starts for records of activity budgets and diet. When estimating range size, it is recommended that the number of days followed should be spread out across the year(s).

TREE TAGS:
It is recommended that aluminium tags be used to permanently mark food and nest trees. Tags are placed at breast height (1.3m above the ground) and should be given a unique number. Tree location should be referenced to the nearest trail and/or with a GPS unit. This allows the investigator to analyze repeat use of food or nest trees and to relocate trees.

10.   OTHER BEHAVIOURAL DATA CONSIDERED FOR COLLECTION.

Can each site provide a list of suggested variables for discussion on potential inclusion within standardised data collection protocol.

1. Gunung Palung

- Distance of separation between individuals in the party
- Start and stop of raining
- Location of orang-utan
- Direction of travel
- Meters climbed (up and down)

Secondary Orang-utan Activities:

- Awake
- Bend tree
- Make a bridge with body
- Wait for baby
- Urinate
- Defecate
- Baby riding on mother
- Angry with person
- Vocalize at person
- Look at person

Additional Data for collection (still to be prepared for standardisation in the future):

- Subdivisions of mating behaviours
- Subdivisions of play behaviours
- Wet and dry weights of food items.
- Nutrient and caloric composition of food items