How orangutans in North America can help orangutans in Indonesia and Malaysia by just opening their mouths!

Felicity Oram

Rehabilitant Siswi at Tanjung Puting

Photo-Jurgen Freund
Captive Orangutan Teeth Emergence Compilation Project

Rehabilitant Siswi at Tantung Putting

Photo-Jurgen Freund

Felicity Oram
Felicity Oram  MSc
Programme Development Advisor – Orangutan Research Team - Hutan – KOCP
MSc Primate Conservation
PhD candidate Universiti Malaysia Sabah

Shauna Tay  BSc candidate –DICE University of Kent

Winny Pramesywari  DVM

Steve Unwin MRCVS Veterinary Officer (NEZS)
Chester Zoo
Veterinary Director – PASA Coordinator
Orangutan Veterinary Advisory Group and member IUCN Reintroduction Specialist Group

Tatyana Humle  PhD
DICE -University of Kent - Academic Advisor

Yenny Saraswati Jaya  DVM - SOCP
Marc Ancrenaz  DVM – Hutan KOCP

Isabelle Lackman  PhD Hutan KOCP

Wild habituated Ramadan
DOB unknown
KOCP study site
25 Feb 2013
Photo Hussein
Conservation ➔
Community + Responsibility + Collaboration + Implementation + Action

Team Sabah
OVAG 2012 Kuala Lumpur
Conservation ➔
Community + Responsibility + Collaboration + Implementation + Action
Conservation ➔
Community + Responsibility + Collaboration + Implementation + Action

Wild
Continuous and ongoing since 1998

Habituated

KOCP STUDY SITE
Ranges of Jenny, Julaina, Maria, Mawar, and Meggie

Legend
FOREST TYPE
- Dry Forest
- Hill Area Dry Forest
- Semi-Humidated Forest
- Swamp Forest

RANGES
- Jenny
- Julaina
- Maria
- Mawar
- Meggie

Wild
## Developmental Milestones of Wild Orangutans

**van Noordwijk & van Schaik (2005)** van and Adrichem et al. (2006) 
*P. abelii* van Noordwijk et al. (2009), *P. p. morio* Oram (2013) in prep

<table>
<thead>
<tr>
<th>Locomotor Competence</th>
<th>Nutritional Competence</th>
<th>Weaning</th>
<th>Ranging Independence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Begins 2 - 3 years</td>
<td>Begins 3 years</td>
<td>7 - 8 years</td>
<td>Begins 8 - 11 years</td>
</tr>
<tr>
<td>• Moving independently except when</td>
<td>• Independent foraging for nutritional purposes</td>
<td>• No longer share mother’s night nest</td>
<td>• Progressive less association with mother and sibling</td>
</tr>
<tr>
<td>• Crossing between trees</td>
<td>• Foraging time significantly lower than mother</td>
<td>• Usually marked by mother’s next pregnancy</td>
<td>Sex</td>
</tr>
<tr>
<td></td>
<td>• Usually marked by mother’s next pregnancy</td>
<td></td>
<td>Males leave sooner Females stay nearby</td>
</tr>
<tr>
<td></td>
<td>• Foraging time approximates mother’s</td>
<td></td>
<td>But individual variation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A lot happens developmentally between 3 – 12 yrs!
Reintroduction Process

Confiscation/evacuation

Quarantine

Socialization

Nursery

Adaptation

Release

SOCP / FZS JAMBI

Quarantine center, Medan
SOCP

Reintroduction station
SOCP – Aceh
FZS - Jambi
Reciprocal field worker exchange

Dr Winny, Roni, Aripin and Deeka
Challenge for rehabilitation and wild research

- AGE ESTIMATION

- Most have no known date of birth

- Whereas in zoos today

- Most orangutans have precise birth dates

Tuti
Female Sumatran
Chester Zoo
8 months 18 days
SOCP tooth chart – info 3-12 years scant

NO permanent incisor, canine and premolar info – and molar quite vague
Particular challenge for OVAG vets and rehab staff –

3 – 12 years

Key age for developmental milestones therefore key ages for rehabilitation

• Permanent front teeth data could fill this gap ...

• But we found very little data have actually been reported ..
Teeth emergence charts for orangutans

- Most data from museum specimens – no known age of birth.
- Most comprehensive captive study to date was published in 1983 (Fooden & Izor) before two species designation.
- What is available is very incomplete - extremely small sample size.
Why hasn’t it been done already?

- Conserved, captured growth accelerated
- Assumed all great apes teeth emergence similar
- Info recorded but not centrally so not readily accessible
- If not dental procedure easily overlooked in immobilizations
- Zoos today don’t need age estimation. Most have known DOB now.
- Assumed all great apes teeth emergence similar
- Hand raised esp.

Conservation ➔ Community + Responsibility + Collaboration + Implementation + Action
Despite more rapid weight gain and skeletal growth, teeth emergence is less affected by environmental conditions in macaques and chimpanzees (Swindler 2002, Smith et al 2010).

Orangutan dental emergence is significantly slower than chimpanzees and more closely parallels humans (Kelley & Schwartz 2010).

Victoria
Female Bornean
Blackpool Zoo UK
DOB July 1984
Photo taken 18 Sep 2013
28 years
Conservation ➔
Community + Responsibility + Collaboration + Implementation + Action

RELAVANCE!

Data deficient
New evidence teeth emergence independent of environment
Known date of birth individuals exist in sufficient numbers
Orangutan teeth emergence later than chimpanzee/gorilla so great apes can’t just be summed together

Aurora At Houston Zoo
Li₁ - left lower deciduous central incisor
First tooth!
Date photo? ? Around 4.5 months???
Conservation ➔
Community + Responsibility + Collaboration + Implementation + Action

**Captive orangutans**
Updated life history baselines benefits captive husbandry
Opportunity for zoo OUs to serve their more elusive fellows in practical way

**Rehabilitant OUs**
Better age estimation = improved husbandry and rehabilitation outcomes
Evidence for law enforcement

**Wild OUs**
Better age estimation = better understanding of life history = improved management and conservation wild populations
Evidence for law enforcement
Some orangutan teeth facts

- Orangutans like humans have 2 sets of teeth.

- 20 deciduous teeth (baby) followed by 32 permanent teeth (adult) same as humans.

- The deciduous teeth are incisors, canines and premolars only.

- These are replaced by permanent incisors, canines and premolars.

- Adults have 3 (but maybe some have 4) molars. The molars are permanent but emerge behind (distal) the deciduous premolars while these baby teeth are still in place.

- There are some labeling inconsistencies between human dentists, veterinarians, primatologists, physical and evolutionary anthropologists that add to confusion on teeth ids… this is why photographs are really helpful!
Conservation ➔
Community + Responsibility + Collaboration + Implementation + Action

Malatus
Female *Pongo Pygmaeus morio*
DOB 18 June 2005
Photo 25 April 2013
7 years 10 months 7 days

Deciduous exfoliation (loss)
and
Permanent emergence overlap

It’s NOT THAT EASY or straightforward to figure out once you have some teeth
Dental Formula orangutans

Deciduous (baby teeth)

\[ i^2 - c^1 - p^2 / i_2 - c_1 - p_2 \times 2 = 20 \]

small letters = deciduous
superscript = upper - subscript = lower

\[ \times 2 = \text{each side of midline} \]

Human baby teeth diagram
Dental Formula orangutans

Deciduous (baby teeth)

\[ i^2 - c^1 - p^2 / i_2 - c_1 - p_2 \times 2 = 20 \]

NOTE: Human dentists call **deciduous premolars** – deciduous molars even though they are actually **premolars**
Conservation ➔
Community + Responsibility + Collaboration + Implementation + Action

human dentistry
3 main different numbering systems !!!
cuspid = canine
bicuspide = premolar

MORE HUMAN dentist /physical anthropologist terms!

Source: americantooth.com
Permanent (adult teeth)

\[ I^2 - C^1 - P^2 - M^3 \quad / \quad I_2 - C_1 - P_2 - M_3 \times 2 = 32 \]
Deciduous (baby teeth)

\[ i^2 - c^1 - p^2 / i_2 - c_1 - p_2 \times 2 \]

Permanent (adult teeth)

\[ l^2 - C^1 - P^2 - M^3 / l_2 - C_1 - P_2 - M_3 \times 2 \]

R \(_2\) - Right lower permanent incisor

Note space for upper canine between lower canine and first premolar

Caroline Stuttgart Zoo
Taken 29 October 2008
By Camern_hf Dlickr
ON upper jaw the space for lower canine to fit is between lateral incisor $I^2$ and canine –
On lower jaw the space for upper canine to fit is between Lower canine and first premolar
This is helpful to remember when looking at individuals that are losing baby teeth and getting adult teeth
Deciduous (baby teeth)

\[ i^2 - c^1 - p^2 / i_2 - c_1 - p_2 \times 2 = 20 \]

2-3 years lots of space in mouth
Iznee
Female *Pongo pygmaeus*
4 years 2 months

Kirana
Female *Pongo abelii*
4 years 5 months

4 years on all spaces seem to disappear as molars come in behind deciduous pre-molars. It’s NOT THAT EASY or straightforward once you have some teeth.
Then you get all sorts of spaces so taking a series once a month really helpful on 4-10 year olds and females and males likely different?

Tanjung Puting

Theo Allofs - Biosphoto
Tanjung Puting
So how old is Miriam?

Is she under 4 or over 4??

Is she missing (exfoliation) her right upper canine??

Answer

Not sure from this view

More open mouth to see premolars and/or molars would be better …

While there is a space clearly visible on her upper right

It may well be the space for her lower canine

In this view we see what certainly appear like deciduous incisors nicely

Miriam – FZS Jambi release site October 2012

Deciduous
wild orangutans do not even begin to travel more than about 50 m from their mother until 7-8 years old
A lot to learn!!!

Etin about 5-6 years old watching his mother Jenny making a nest
Data requested from you and your orangutans

- known DOB ≤15 year olds
  - Need larger sample size
  - 5 months – 2 years
  - Confirm and extend current deciduous data
  - Sumatran/Bornean /hybrid same or different
  - New data permanent emergence

- 4-12 year olds
  - permanent incisors, canines, premolars
  - Timing and sequencing
  - Better age estimation at critical developmental stages
  - Sex /species differences?

- From ≥15 all Adults
  - 3 or 4 molars presence/absence
  - Normal variation /species /subspecies difference?

Utara Female Pongo abelii
9 years 3 months
What we need

- Initial presence / absence by opportunistic or as part of routine open mouth training especially 1-15 year olds

- From this we will target important representative individuals for follow ups -- Because it isn’t as straightforward as it might seem to id teeth PHOTOS ARE REALLY HELPFUL.

- Notation and full documentation with photos as a part of all pre-ship exams …
Sangat besar, gigi yang dipakai - janggut panjang
Malu tetapi tenang di seluruh kakitangan
sangat pandai - berjalan-jalan di atas tanah
Conservation ➔
Community + Responsibility + Collaboration + Implementation + Action

What we need to know

- House name
- Zoo of residence
- DOB
- Species
- Isis #, or other ID #s
- Sex
- Hand or maternally raised or or surrogate OU or mixed (details)
- Date of observation and specifics - Photos are especially helpful!
- Trainer contact for follow up if possible
Coding system for emergence

- 0 = tooth absent
- 1 = tooth present
- 2 = tooth fully emerged
- 3 = tooth actively growing but not fully emerged
- 4 = tooth budding or just broken the skin
- 5 = tooth missing (exfoliated) was there but now missing
Coding system for infant care

1 = wholly mother raised

2 = wholly hand raised – removed from dam within 24 hours of birth

OTHER – please supply details

3 = removed from dam within 24 hours of birth and successfully introduced and raised by surrogate orangutan female within one month

4 – combination - e.g. maternal care 10 days removed for insufficient nursing at 20 days hand raised 3 months then reintroduced to dam - fed by bottle x intervals (list) by dam presenting infant to mesh.
Coding system for species

- 1 = Bornean – *Pongo pygmaeus*
- 2 = Sumatran – *Pongo abelii*
- 3 = hybrid
Conservation ➔
Community + Responsibility + Collaboration + Implementation + Action

Thank you
Questions ?

orangjuga1@gmail.com
opticon@earthlink.net
Conservation ➔
Community + Responsibility + Collaboration + Implementation + Action

orangjuga1@gmail.com

opticon@earthlink.net