Effects of a Riverine Dispersal Barrier on Cultural Similarity in Wild Bornean Orangutans

^ & a little about "YEAR OF THE ORANGUTAN" at the Philadelphia Zoo

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Effects of a Riverine Dispersal Barrier on Cultural Similarity in Wild Bornean Orangutans (*Pongo pygmaeus wurmbii*): 2003 - 2007

SUNGAI LADING

TUANAN

Bastian, 2008; Bastian et al., 2010 / 2012

Understanding the Role of Ecology in Orangutan Reproduction: A Cross-Site Comparison: 2008 - 2010

In collaboration with **TUANAN**, SABANGAU, KETAMBE

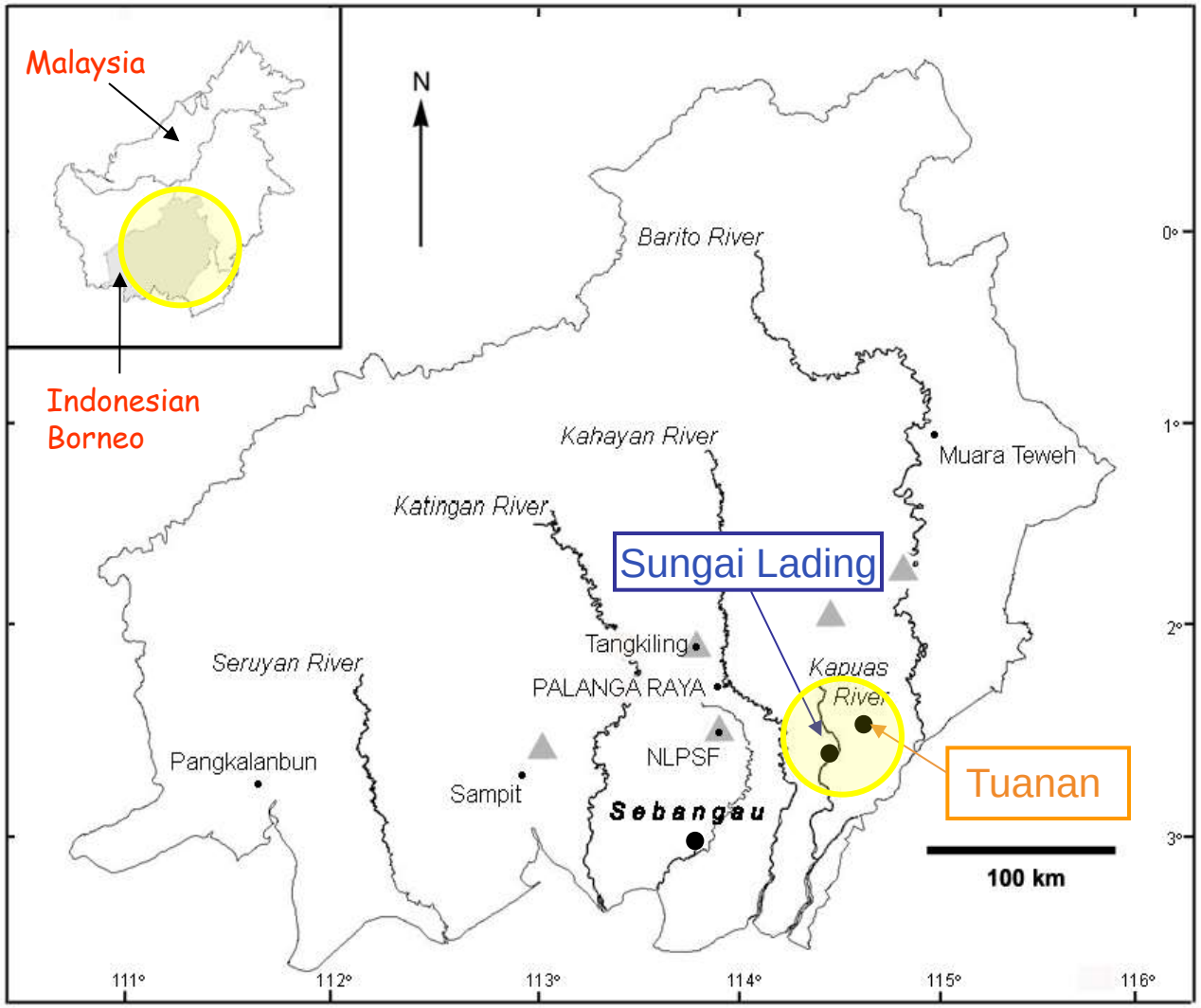
GUNUNG PALUNG

Bastian & Knott, in prep

Wild Orangutan Field Sites

★ PhD Fieldwork (2003-2007) ○ Post-doc Fieldwork (2008-2010)

Field Research 2003-7



adapted from Struebig et al. 2007

Distance Sungai Lading - Tuanan: **12.6km**

Definitions of Culture

Hans Kummer (1971) on culture:

"…the behavior of two groups with the same **gene pool** and **same type of habitat** can differ only by **culture**".

van Schaik *et al*. (2003) on orangutan culture:

Culture: behavioral **innovations** that spread to multiple individuals within a single population and have a **patchy global occurrence** across all orangutan sites

Pongo as a Model Taxon for Investigation of Culture

Slow life history, long inter-birth interval

Intimate mother-infant bond

High **social tolerance**

van Noordwijk & van Schaik, 2005

Variable Sociality

Orangutans are the most solitary of the great apes but they are HIGHLY SOCIAL and sometimes form large parties

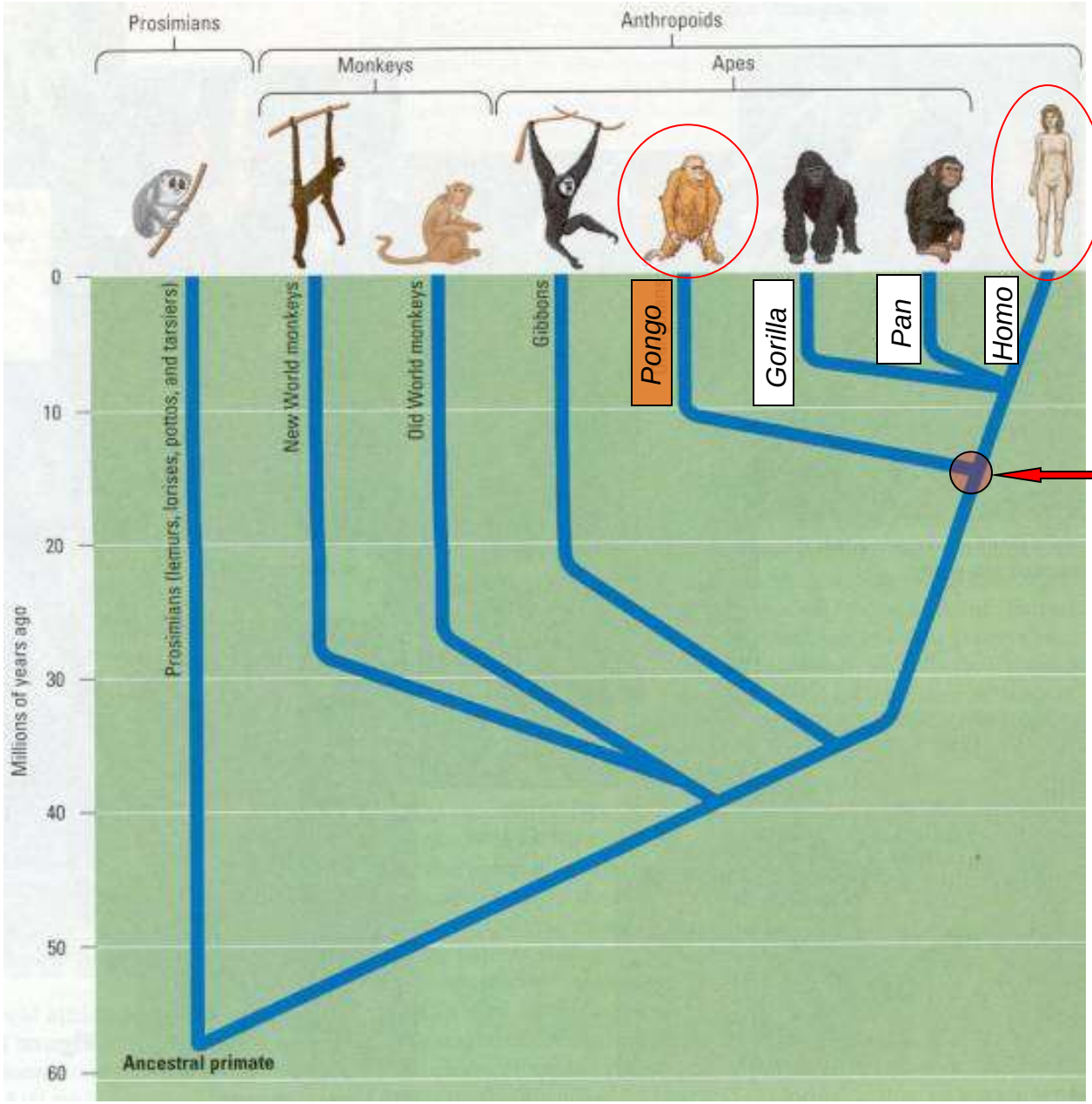
van Schaik et al., 2003

Orangutan Intelligence

Capable of **advanced cognitive tasks** & **flexible tool-use**

van Schaik et al., 1999; van Schaik & Knott, 2001; Schumaker et al., 2011

Least Closely Related (Great Ape) to Humans



PhD Fieldwork: Orangutan Cultures

BEHAVIORAL AND BRAIN SCIENCES (2007) 30, 393–437
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DOI: 10.1017/S0140525X07002373

Animal innovation defined and operationalized

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BRILL *Behaviour 149 (2012) 275–297* **Behaviour** brill.nl/beh

Innovative behaviors in wild Bornean orangutans revealed by targeted population comparison

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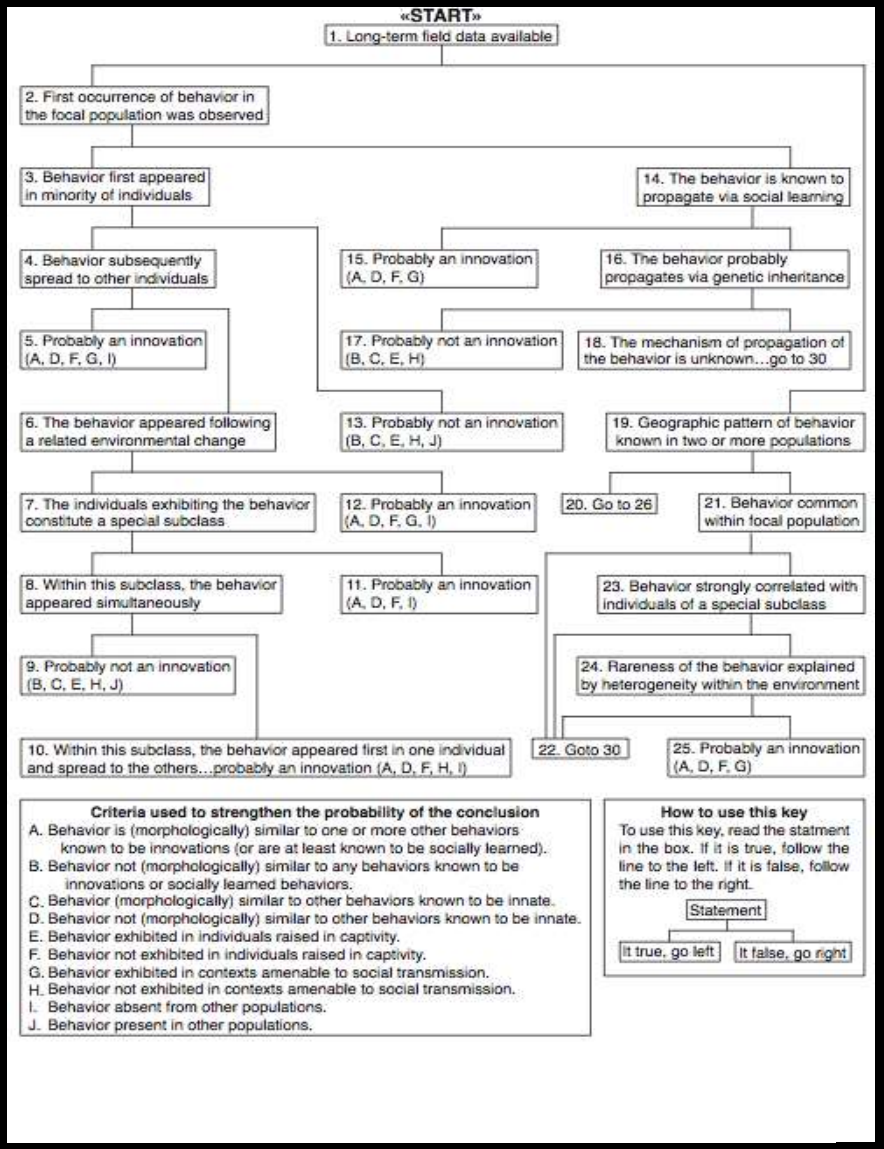
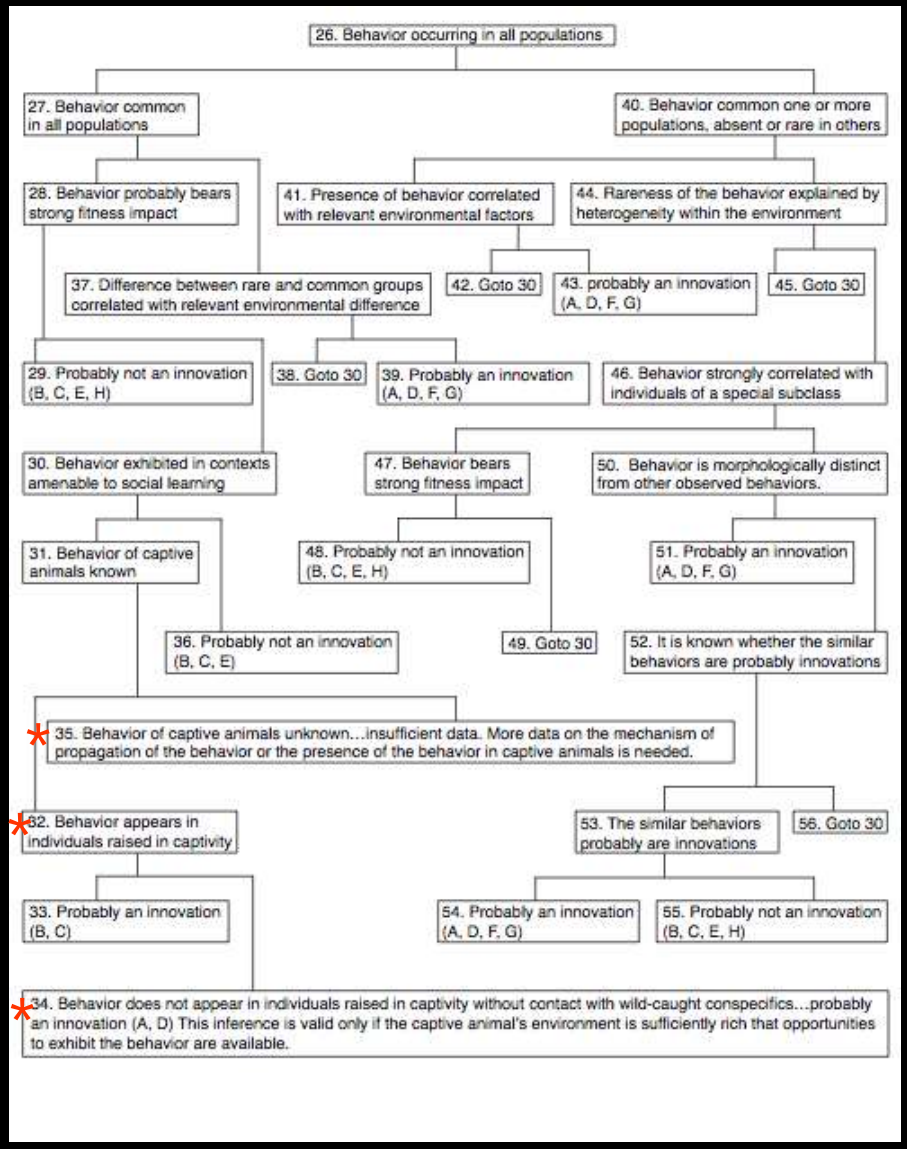
<u>Innovation</u>: the process that generates in an individual a novel learned behavior that is not simply a consequence of social learning or environmental induction.

Key for Determining Innovation Status of a Behavior





Ramsey, Bastian & van Schaik, 2007

Comparison of 2 Heavily Logged Peat Swamps

SUNGAI LADING

- est. by **M. Bastian** April ’05
- 200ha, **7.68** indiv/km^2

Similar Habitats

TUANAN

- est. by **C. van Schaik** & **M. van Noordwijk** Jan ’03
- 945ha, **4.5** indiv/km^2

Similar Habitats

SgL Local Name	TU Local Name Name	Growth Form	Family	Genus	Species
	Akar buntut	EP	Orchidaceae	Paraphalaenopsis	sp.
Akar gerising	Akar gerising	VI	Pandanaceae	Freycinetia	sp.
Tarantang	Tarantang	TR	Anacardiaceae	Campnosperma	coriaceum
Gerising besar	Gerising besar	GV	Pandanaceae	Pandanus	sp.
Gerising kecil	Gerising kecil	GV	Pandanaceae	Pandanus	sp.
Kambaisin mahawai buah kecil (2)		TR	Annonaceae	polyalthia	rumphii
Kambasira daun kecil	Kambasira (hatue)	TR	Aquifoliaceae	Ilex	cymosa
Kamehas	Kamehas/Kamehas daun kecil	TR	Lauraceae	Litsea	cf. rufo-fusca
Kapurnaga jangkar	Kapur naga jangkar	TR	Guttifereae	Calophyllum	inophyllum
Karamuan/Kamuan	Karamuan_TU	TR	Lauraceae	Alseodaphne	sp.
Karamunting	Karamunting	TR	Melastomataceae	Melastoma	malabathricum
Mangkinang blawao	Mangkinang blawao	TR	Eleocarpaceae	Elaeocarpus	mastersii
Matahari	Matahari	TR	Sapindaceae	Lepisanthes	amoena
	Mipa (=Garunggang)	TR	Hypericaceae	Cratoxylum	glaucum
Nonang (1)	Nonang	TR	Euphorbiaceae	Antidesma	cf. cuspidatum
Nonang (2)		TR	Annonaceae	Goniathalamus	sp.
Rasak gambir	Rasak bukit/Kayu rasak	TR	Dipterocarpaceae	Cotylelobium	melanoxylon
Rengas parei	Rengas parei (Rengas)	TR	Anacardiaceae	Buchanania	sp.
Tagula DK (1)	Tagula	TR	Lauraceae	Litsea	angulata
Tarantang	Tarantang	TR	Anacardiaceae	Campnosperma	coriaceum
Tatumbu pohon merah	Tatumbu pohon merah/T.empat gigi	TR	Myrtaceae	Syzigium	cf. tawahense
	Tilap (tree)	TR	Moraceae	Artocarpus	elasticus
	Tumih	TR	Rhizophoraceae	Combretocarpus	rotundatus
Akar kalalawit laki2		VI	Annonaceae	Artabatrys	suveyalans
Akar tambalalung		VI	Araceae	Raphidophora	sp.
Anggrek 2 (UNK)		EP	Orchidaceae	Bulbophyllum	sp.
Kayu bajakah	Bajakah	TR	Lauraceae	Endiandra	sp.
Bambuning		GV	Palmae	Pinanga	sp.
Karuing	Karuing	TR	Dipterocarpaceae	Dipterocarpus	fagineus
Kayu lalas SgL	Galam tikus	TR	Myrtaceae	Syzygium	sp.1
Kayu puting	Kayu puting	TR	Ebenaceae	Diospyros	sp.1
Kayu tajl	Kayu tajl ?	TR	Ebenaceae	Diospyros	sp.2
Kumpang daun panjang		TR	Myristicaceae	Knema	glaucescens
Seri bangking	Lalak manuk	TR	Meliaceae	Chisocheton	sarawakanus
Pahakong bajey		EP	Davalliaceae	Davallia	sp.
Pahakong DB		EP	Aspheniaceae	Asplenium	cf. phyllitidis
Pahakong DK		EP	Polypodiaceae	Drynaria	sp.
Ramania hutan		TR	Anacardiace	Bouea	oppositifolia
Rasau kalep		GV	Pandanaceae	Pandanus	cf. mottleyanus
Rotan anak		GV	Palmae	Daemonorops	sp.1
Rotan paka		GV	Palmae	Korthalsia	sp.1
Tabaras		TR	Polygalaceae	Xenthophyllum	discolor
Takasai	Takasai	TR	Sapindaceae	Pometia	pinnata
Akar kamunda SgL		VI	Connoraceae	Connarus	odoratus

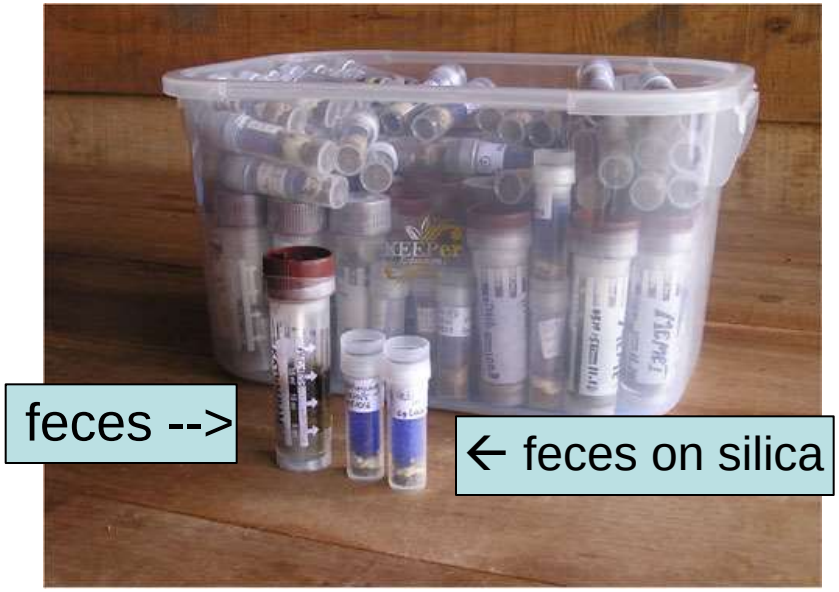
Daily: monitor rainfall & temperature; collect, morphotype & process food samples

Monthly: monitor fruit, flower & leaf phenology of 1537 trees at SGL, 1599 trees at TU)

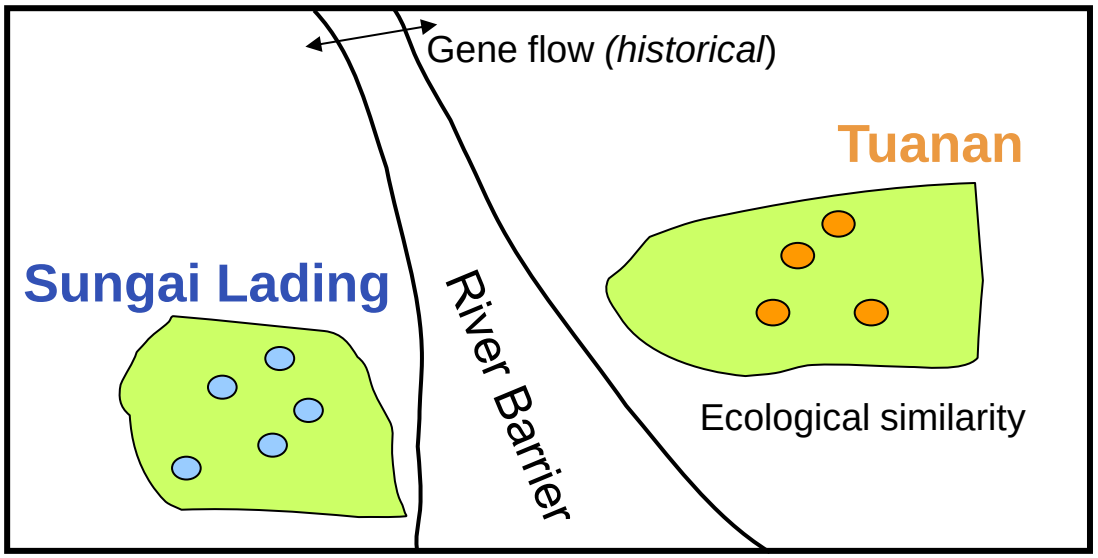
One-time: monitor 23 smaller vegetative plots throughout each site

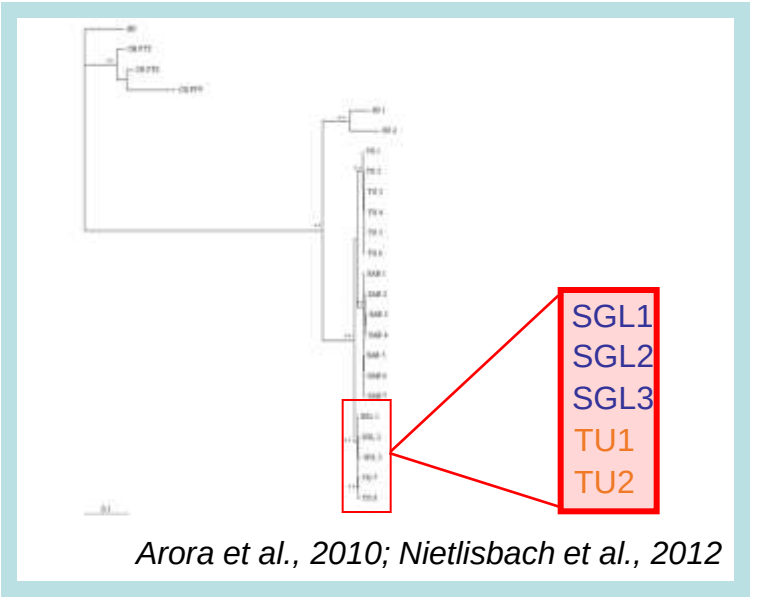
Similar Genetics

Collecting orangutan feces



Orangutan fecal samples





Arora et al., 2010; Nietlisbach et al., 2012

Orangutan Density Estimates

SUNGAI LADING

200 ha, 7.68 indiv./km^2

extreme population compression

Status of Wild Bornean Orangutans (*Pongo pygmaeus wurmbii*) at Sungai Lading, a Heavily Disturbed Peat Swamp Forest in Central Kalimantan, Indonesia

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[3] Anthropologisches Institut & Museum, University of Zürich, Winterthurerstrasse 190, 8057-CH Zurich, Switzerland.

(in prep for Submission to Biological Conservation)

TUANAN

945 ha, 4.5 indiv./km^2

minimal population compression

Primates (2005) 46:249–254
DOI 10.1007/s10329-005-0134-z

ORIGINAL ARTICLE

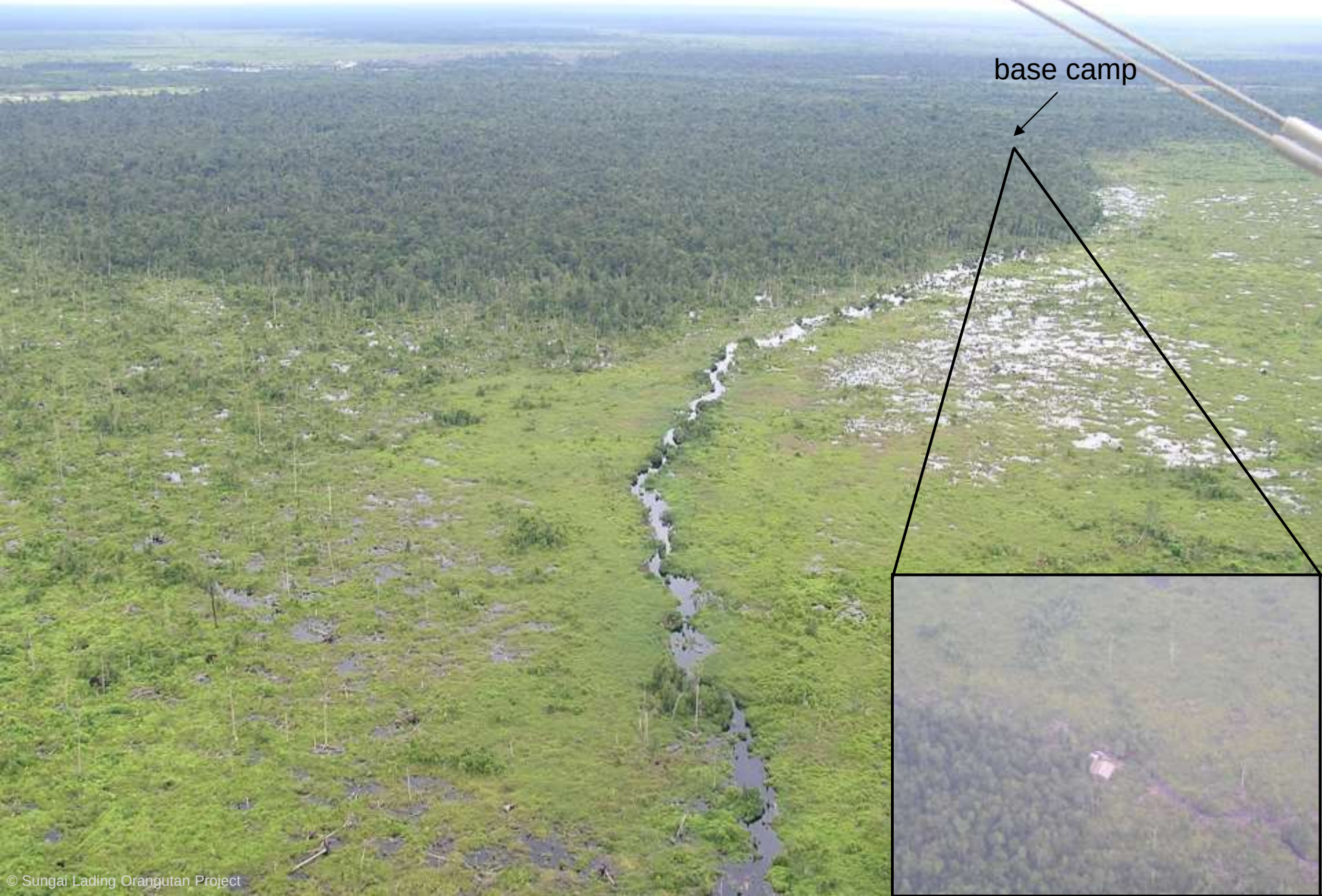
Carel P. van Schaik · Serge A. Wich · Sri Suci Utami
Kisar Odom

A simple alternative to line transects of nests for estimating orangutan densities

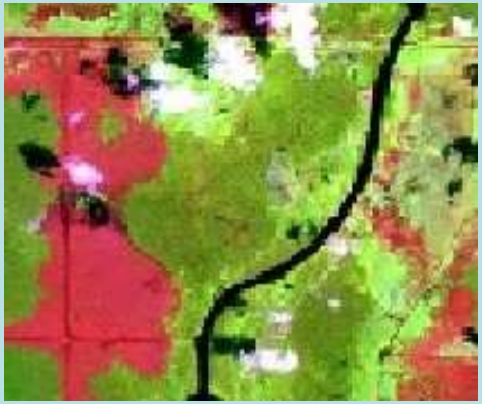
Aerial & Ground Surveys

Sungai Tunggul

Sungai Lading



Sungai Lading Orangutan Project

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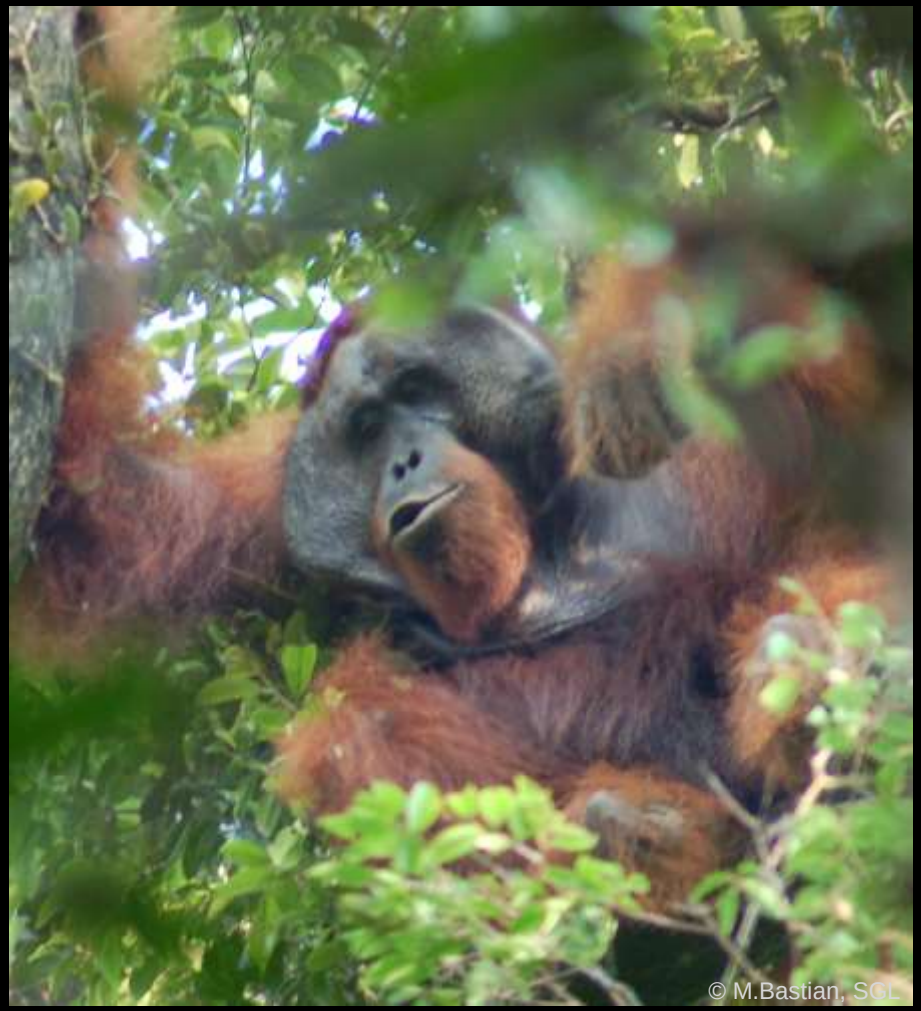
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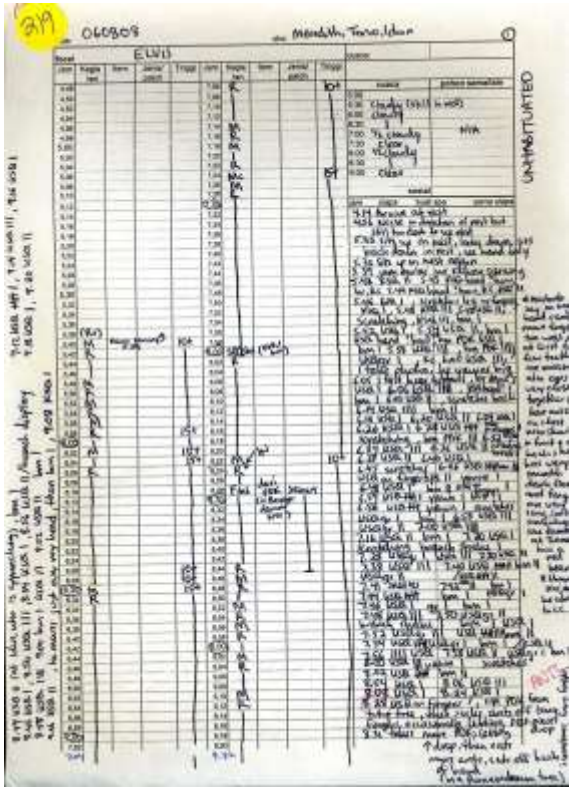
ALL DAY Follows (Nest-Nest)

Sungai Lading:
2.5yrs, 3,260 hrs focal data



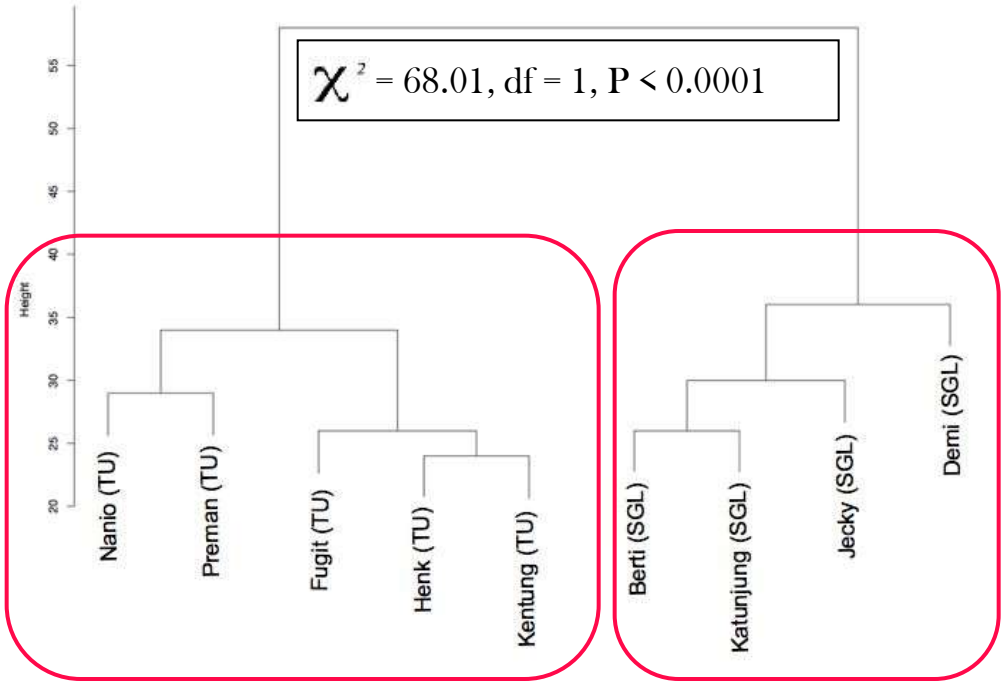
Diet Traditions in Wild Orangutans

AMERICAN JOURNAL OF PHYSICAL ANTHROPOLOGY 143:175–187 (2010)

Diet Traditions in Wild Orangutans

Meredith L. Bastian,[1,2] Nicole Zweifel,[3] Erin R. Vogel,[4] Serge A. Wich,[5,6] and Carel P. van Schaik[1,3]*

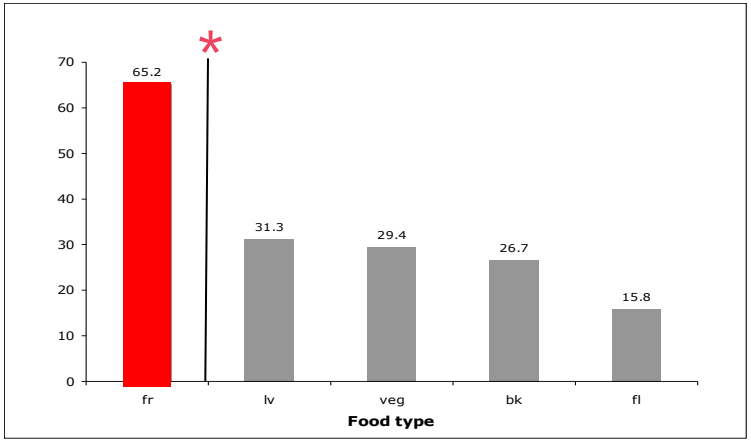
Individual diet profiles **cluster** significantly **by population**



Tuanan

Sungai Lading

Social acquisition of diet, followed by individual fine-tuning via trial-and-error learning (*possible only in intelligent, long-lived species*)



% overlap lowest for lower quality, more difficult to process foods

Bastian et al., 2010

Responses to Fruit Scarcity

Increasing reliance on bark, also buys better coping with selective logging

- inner bark

Fallback Foods

- rotan pith

- leaves

Marshall & Wrangham, 2007; Bastian et al., 2010

Behavioral Variation

SUNGAI LADING (SGL)

Local Prevalence at Sungai Lading

Individual	Class	Nest Smack	Throat scrape	Coercive hand-hold	Nest sharing (night)	"Artistic" lining	"Pop" nest vocal	"Grind" nest vocal	Tooth pick	Leaf blanket, no nest	Branch cushion	Twig-biting	KSQ with leaves	Leaf carry	Snag riding
		A	A	A	R	R	R	R	R	R	H+	R	H+	C	H
BERTI	AF				?					?	?			?	
DEMI	AF			?	?	?	?	?	?	?		?	?		
KATUNJUNG	AF			?		?	?	?	?	?		?	?		
LALA	AF			?	?	?	?	?	?	?	?	?	?	?	
WINA	AF	?	?			?	?	?	?	?		?	?	?	?
VELVEETA	ImmF			?	?	?	?	?	?	?		?	?		?
TINO	ImmM	?		?	?	?	?	?	?	?	?	?	?	?	?
ELVIS	AFM			?	?	?	?	?	?	?		?	?		
SUNI	AFM	?		?	?	?	?	?	?	?	?	?	?	?	?
FRANKLIN	UFM			?	?	?	?	?	?		?	?	?		?
IMAM	UFM			?	?	?	?	?	?		?		?	?	?
JECKY	UFM					?		?		?		?			
RHOMA	UFM			?	?	?	?	?	?	?	?	?		?	?

= behavior observed

= behavior not observed (Poisson > 95%)

? = insufficient observation time

= N/A (based on context of behavior)

χ^2 Analysis indicates a **clustering of *cultural* behaviors** by population:

$\chi^2 = 68.01$, df= 1, $P < 0.0001$

TUANAN (TU)

Local Prevalence at Tuanan

Individual	Class	Nest Smack	Throat scrape	Coercive hand-hold	Nest sharing (night)	"Artistic" lining	"Pop" nest vocal	"Grind" nest vocal	Tooth pick	Leaf blanket, no nest	Branch cushion	Twig-biting	KSQ with leaves	Leaf carry	Snag riding
		C	C	H	A	A	A	A	A	A	C	C	H+	H	H
DESY	AF			?		?	?	?	?	?				?	
INUL	AF		?	?	?	?	?	?	?	?	?	?		?	?
JINAK	AF												?		
JUNI	AF														
KERRY	AF						?	?							
MINDY	AF			?											
SUMI	AF			?									?		
KONDOR	ImmF			?		?	?	?		?			?		?
LOLO	ImmF			?		?	?	?	?	?	?	?	?	?	?
BUDHI	ImmM			?	?	?	?	?	?	?	?	?	?	?	?
NANIO	ImmM			?		?	?	?	?	?			?		?
OTIS	ImmM			?	?	?	?	?	?	?	?	?		?	?
ADIK NIKO	AFM			?	?	?	?	?	?	?	?	?	?	?	?
ALDO	AFM			?	?	?	?	?	?	?	?	?	?	?	?
AQIL	AFM			?		?	?	?	?	?		?		?	?
BOBO	AFM			?		?	?	?	?	?		?	?	?	?
DAYAK	AFM					?	?	?		?		?	?		?
FUGIT	AFM					?	?	?		?			?		
HENK	AFM			?		?	?	?		?	?		?	?	?
ISIDOR	AFM			?		?	?	?	?	?	?	?	?	?	?
JIMI	AFM			?		?	?	?	?	?					?
KAY	AFM			?		?	?	?	?	?	?	?		?	?
KENTUNG	AFM			?		?	?	?		?			?		?
LUWI	AFM			?		?	?	?	?	?			?	?	?
NADI	AFM			?	?	?	?	?	?	?	?		?	?	?
NIKO	AFM			?		?	?	?	?	?	?			?	?
RAMBO	AFM			?		?	?	?		?	?		?		?
SULTAN	AFM			?		?	?	?	?	?		?	?	?	?
TEJU	AFM			?	?	?	?	?	?	?	?	?	?	?	?
UCOK	AFM	?		?	?	?	?	?	?	?	?	?	?	?	?
ZEKE	AFM			?	?	?	?	?	?	?	?	?	?	?	?
CIPTO	UFM	?		?	?	?	?	?	?	?	?	?	?	?	?
EKKO	UFM			?	?	?	?	?	?	?	?	?		?	?
GISMO	UFM					?	?	?		?		?	?	?	?
OGUN	UFM			?	?	?	?	?	?	?	?	?	?	?	?
PREMAN	UFM					?	?	?		?					
SAMSON	UFM	?		?	?	?	?	?	?	?	?	?	?	?	?
WODAN	UFM					?	?	?		?	?	?		?	?
YOGA	UFM			?	?	?	?	?	?	?	?	?	?	?	?

Behavioral Variation

- NEST SMACK
- THROAT SCRAPE
- COERCIVE HAND-HOLDING

High local prevalence at Tuanan, absent in Sungai Lading population

BRILL *Behaviour (2012)* DOI:10.1163/156853912X636726 **Behaviour** brill.nl/beh

Innovative behaviors in wild Bornean orangutans revealed by targeted population comparison

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[b] Department of Evolutionary Anthropology, Duke University, P.O. Box 90383, Durham, NC 27708-0383, USA
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Innovations constrained in more compressed population due to low rates of association/opportunities for cultural transmission

OPEN ACCESS Freely available online PLoS one

Call Cultures in Orang-Utans?

Serge A. Wich[1,2]*, Michael Krützen[1,9], Adriano R. Lameira[3,9], Alexander Nater[1], Natasha Arora[1], Meredith L. Bastian[4], Ellen Meulman[1], Helen C. Morrogh-Bernard[5], S. Suci Utami Atmoko[6], Joko Pamungkas[7], Dyah Perwitasari-Farajallah[7], Madeleine E. Hardus[8], Maria van Noordwijk[1], Carel P. van Schaik[1]

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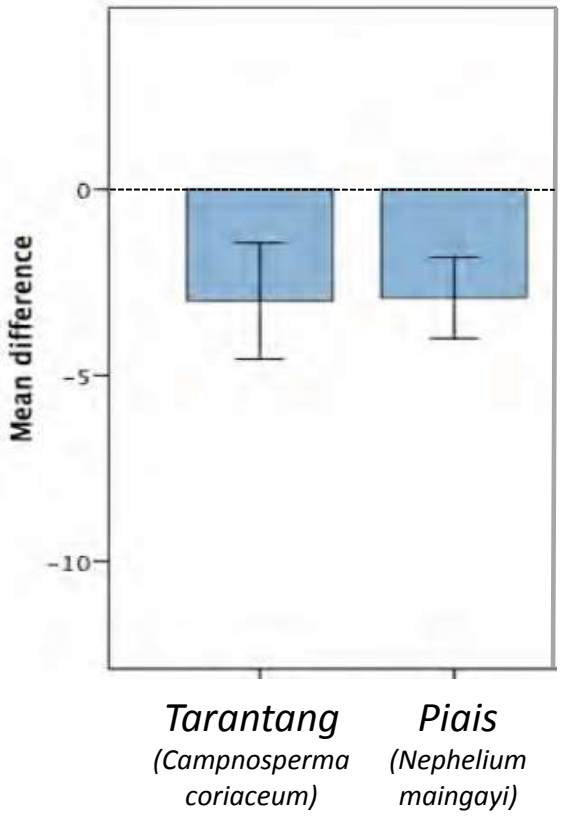
Innovations in Nesting - Tree Selection

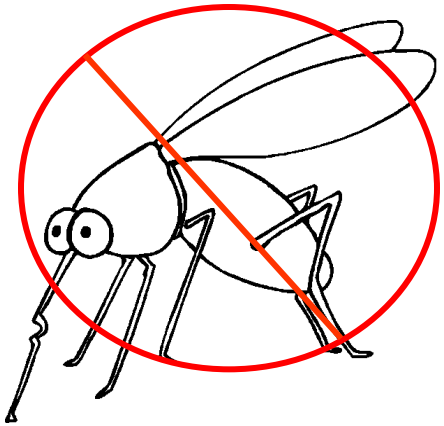
Tarantang

- Tarantang (*Campnosperma coriaceum*)
  - preferred by orangutans
    - especially by mothers and infants
    - more so during the mosquito season



Leaf Carrying for Nest Building

- *Tarantang & Piais leafy branches carried to other nest sites in same and different tree species*



Use of leaves as mosquito repellant

Mosquito Avoidance Drives Selection of Nest Tree Species in Bornean Orang-Utans

Claudine J. Largo [a], *Meredith L. Bastian* [b], *Carel P. van Schaik* [a]

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Folia Primatol 2009;80:106–174

Florez, 2007; Bastian, 2008; Largo et al., 2009; Bastian et al., 2012


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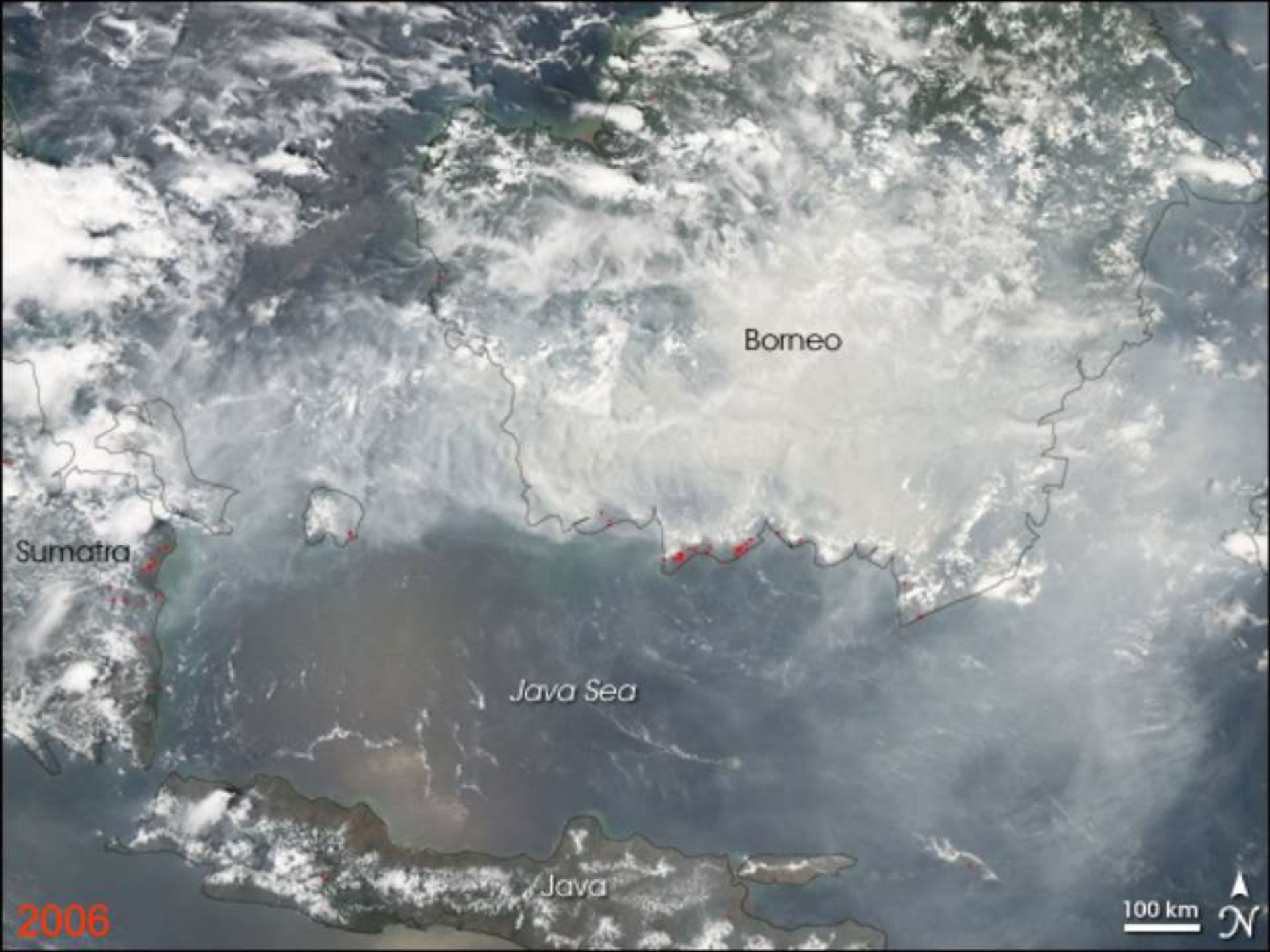
Rainy Season, 2006

Dry Season, 2006


Borneo
Sumatra
Java Sea
Java
2006
100 km
N

Sungai Lading (2005 - 2009)

Sungai Lading (2010)

Orangutan Habitat Loss Impacts Many Other Species

Reasons for Hope

orangutan bridges


NEW STRAITS TIMES 2 PRIME NEWS MONDAY, APRIL 12, 2010

No bridge too far for orang utans

longterm field research presence

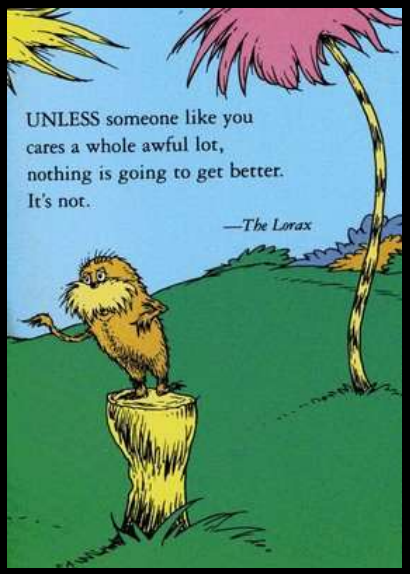


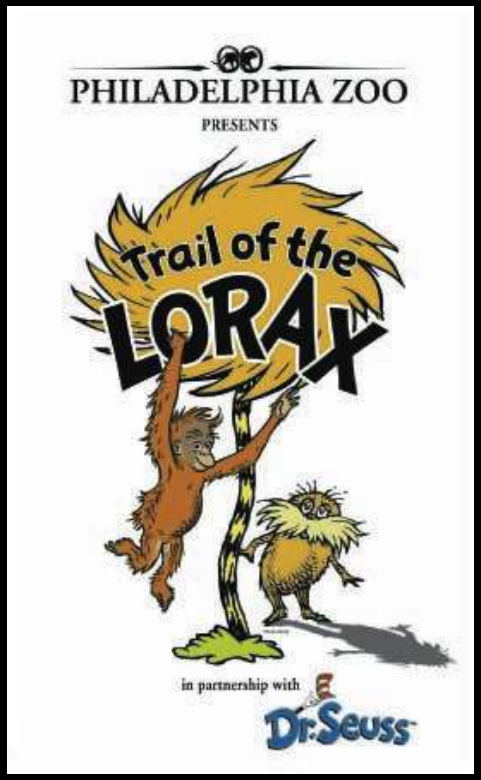
promising collaborations between zoos & conservation organizations such as SOCP

PHILADELPHIA ZOO
AMERICA'S FIRST ZOO

SUMATRAN ORANGUTAN CONSERVATION PROGRAMME


Partnership between Philadelphia Zoo & Dr. Seuss





“Year of the Orangutan” at the Philadelphia Zoo

- Scout contests
- Zoo CREW Action Plan
- K-12 Unless Contest
- University Prize Challenge

Troop 71915 Girl Scouts of Central and Southern New Jersey

“Year of the Orangutan” at the Philadelphia Zoo

- Online Thank You Notes to Companies committed to CSPO by 2015

- Guest Conservation Engagement
  - 3-D Glasses Distribution
  - Leaves of Gratitude
  - Conservation Talks

- Staff Conservation Engagement
  - “Picture This” Photo Challenge / Zoo Donation to SOCP’s Drone project
  - Orangutan Field Conservation Seminar Series

- Onsite Sustainability Efforts

- Collaborations between Zoo &
  - SOCP — SUMATRAN ORANGUTAN CONSERVATION PROGRAMME
  - Seventh Generation — seventh GENERATION

Great Ape Trail

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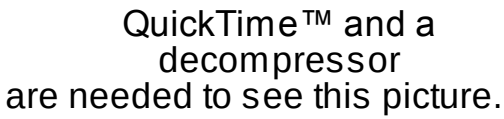
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are needed to see this picture.

Thank You!

FIELD RESEARCH

YEAR OF THE ORANGUTAN