

# HÁ ALGO DE NOVO NO PASSADO: O ESTADO DA ARTE NA PESQUISA ARQUEOLÓGICA NA AMAZÔNIA



URNAS FUNERÁRIAS DA COSTA NORTE DA FOZ DO RIO AMAZONAS (Rostain 2010)

**Eduardo G. Neves,**  
**Conferência FAPESP 22.03.24**

**A FAPESP E O FINANCIAMENTO DE PESQUISAS  
ARQUEOLÓGICAS NA AMAZÔNIA REALIZADAS PELO  
MUSEU DE ARQUEOLOGIA E ETNOLOGIA DA  
UNIVERSIDADE DE SÃO PAULO DESDE 1999:**

**79 BOLSAS E AUXÍLIOS**

**19** AUXÍLIOS CONCLUÍDOS,  
**4** BOLSAS BR EM ANDAMENTO,  
**49** BOLSAS BR CONCLUÍDAS.  
**5** BOLSAS EXTERIOR CONCLUÍDAS.

**150-200**  
billion tons of C  
stored in soil and vegetation

**13%**  
of all trees species  
world-wide

**-2.400**  
fish species  
supporting large  
biomass in highly  
productive rivers

**-5.6**  
Million km<sup>2</sup>  
of the largest contiguous region of  
moist, tropical forests on Earth

**One Every  
other day**  
a new species is described

**16%**  
Global Terrestrial  
Primary Production

**16-22%**  
of the total world river  
discharge

**66**  
Million years  
of evolution have  
helped to produce  
60+ vegetation types

**-150**  
plant species  
cultivated and domesticated

**410**  
ethnic groups  
80 living in voluntary isolation

**12,000**  
years of indigenous  
legacy

About  
**58%**  
Fish

**20%** **34%**  
Birds Mammals

not found  
elsewhere

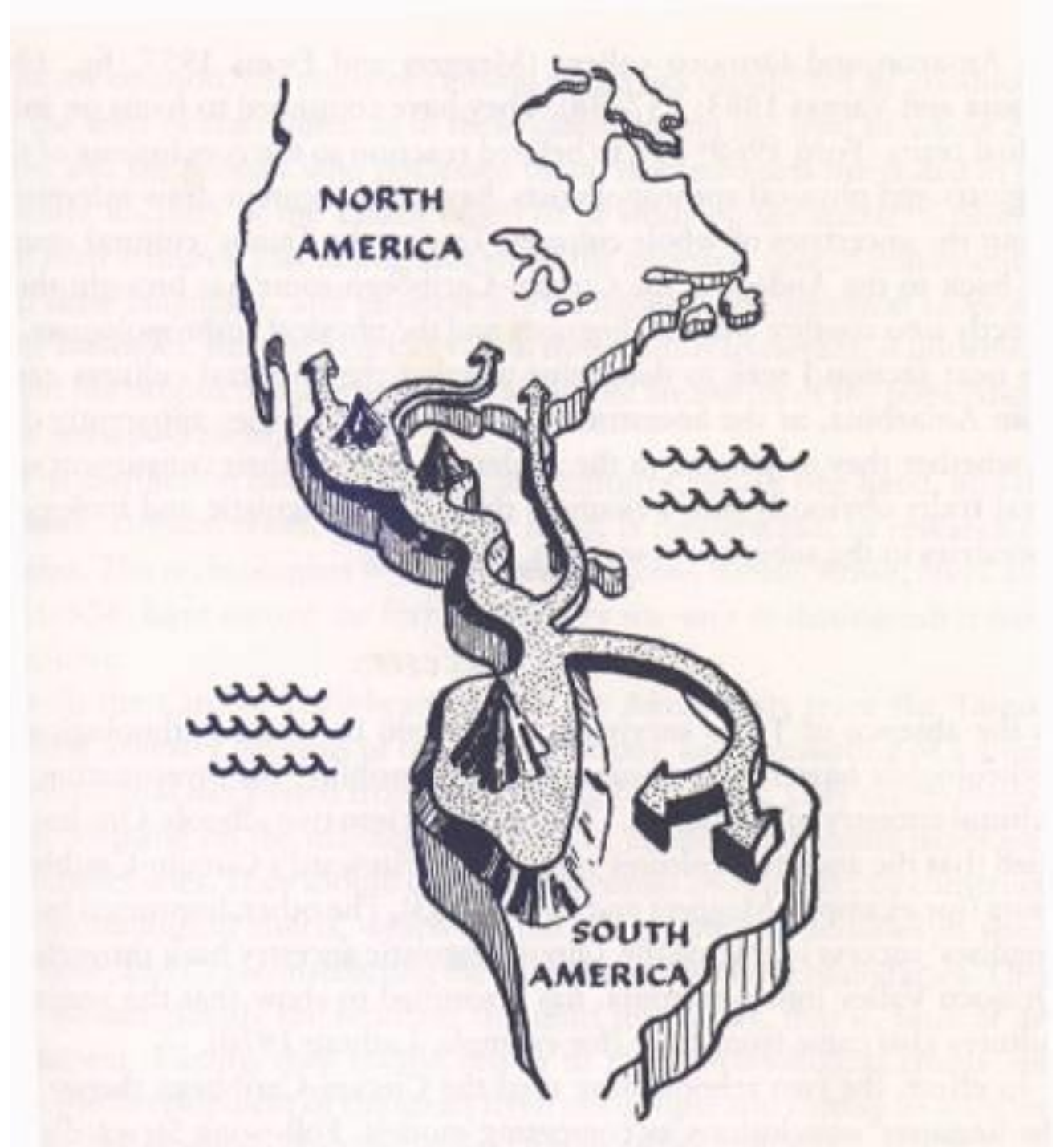
**4**  
independent  
Centers  
of the first ceramics  
of New World

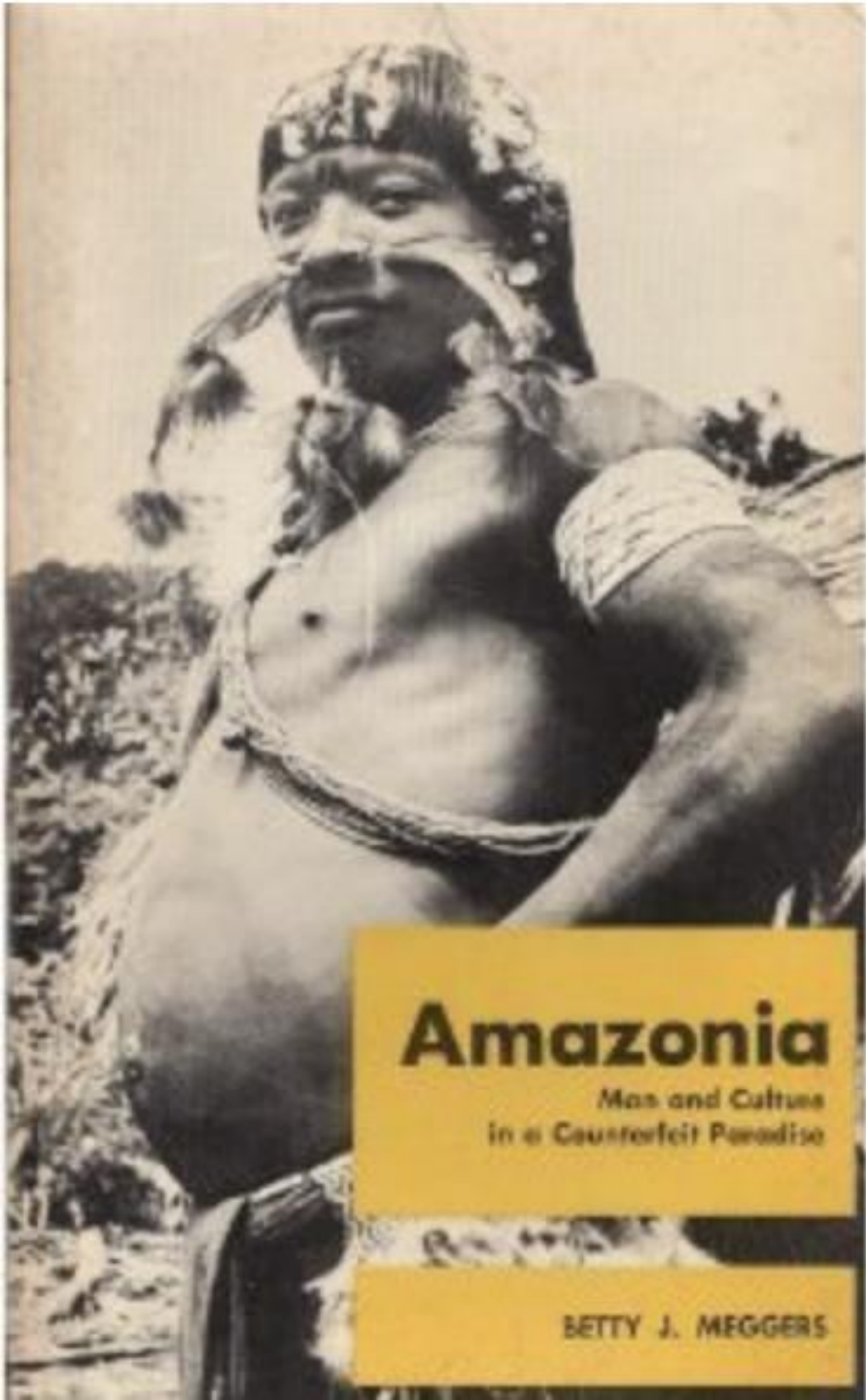
**+40**  
Million  
inhabitants,  
60% in cities

# THE AMAZON IN NUMBERS



**The “standard model” for  
the Ancient History of  
South America** (Rouse 1992)





# Amazonia

Man and Culture  
in a Counterfeit Paradise

BETTY J. MEGGERS

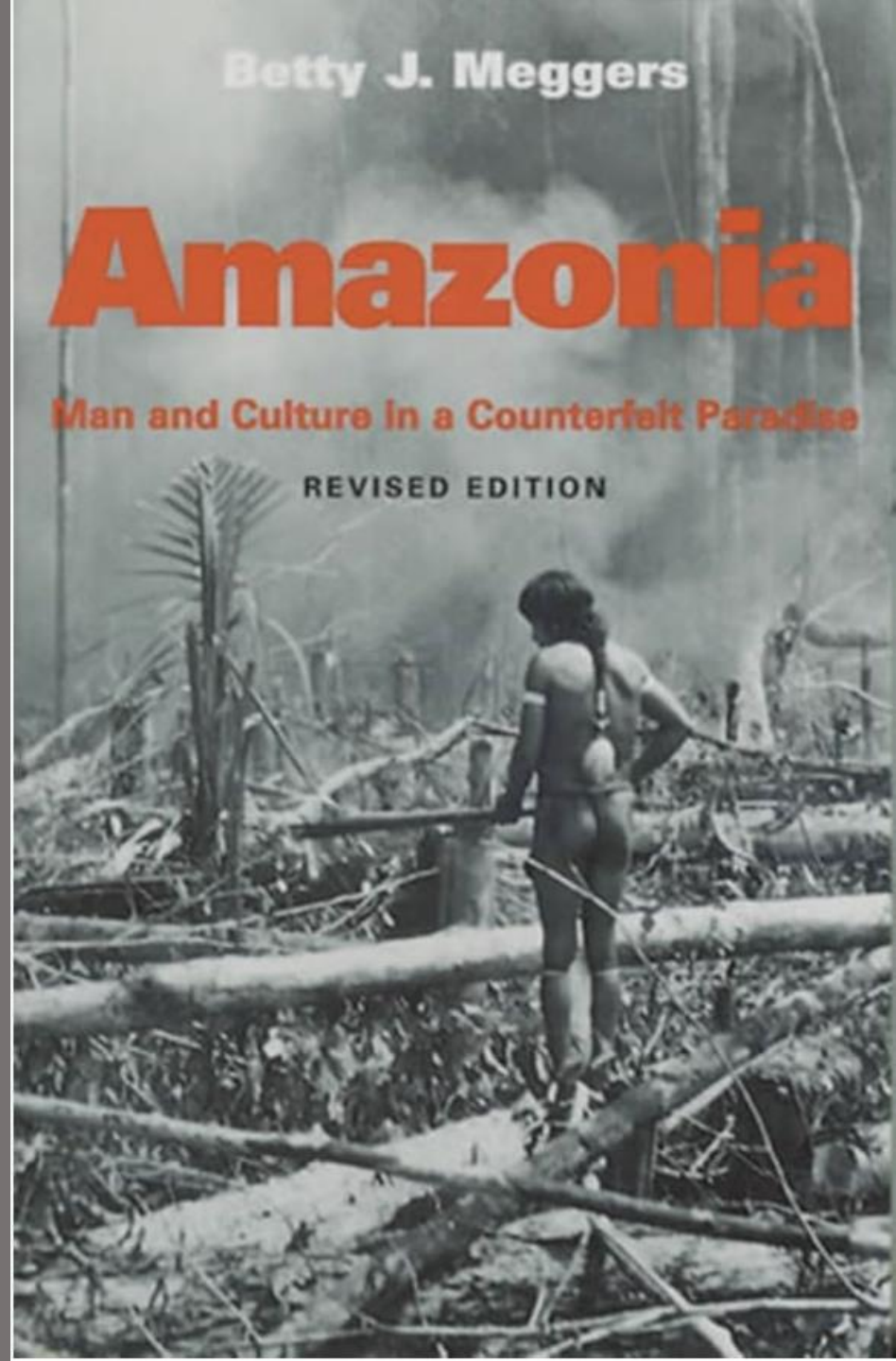
“THE COUNTERFEIT  
PARADISE”

Betty J. Meggers

# Amazonia

Man and Culture in a Counterfeit Paradise

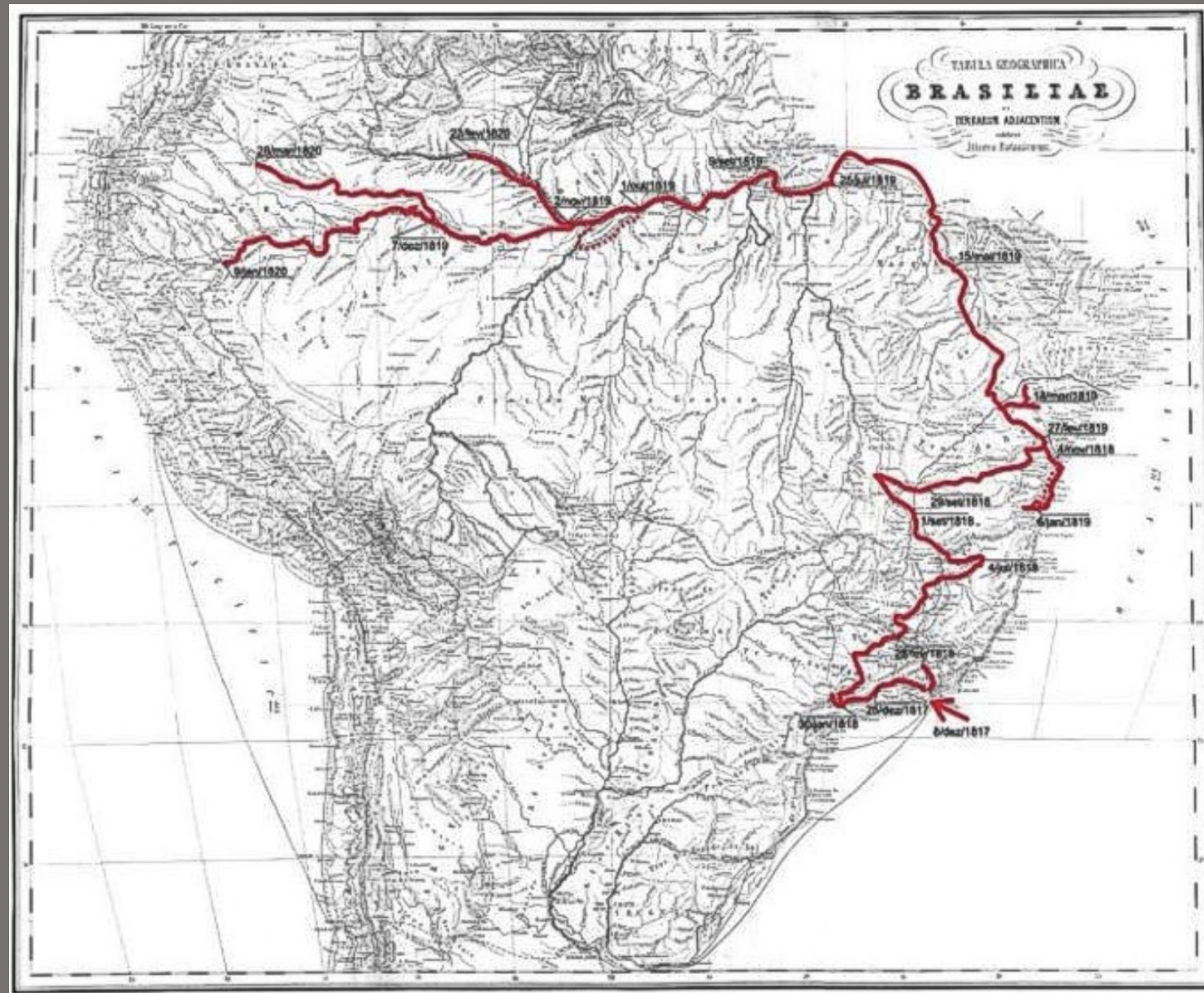
REVISED EDITION





**CARL VON MARTIUS**  
**(1794-1868)**

**VIAGEM AO BRASIL  
(1817-1820)  
SPIX & MARTIUS**

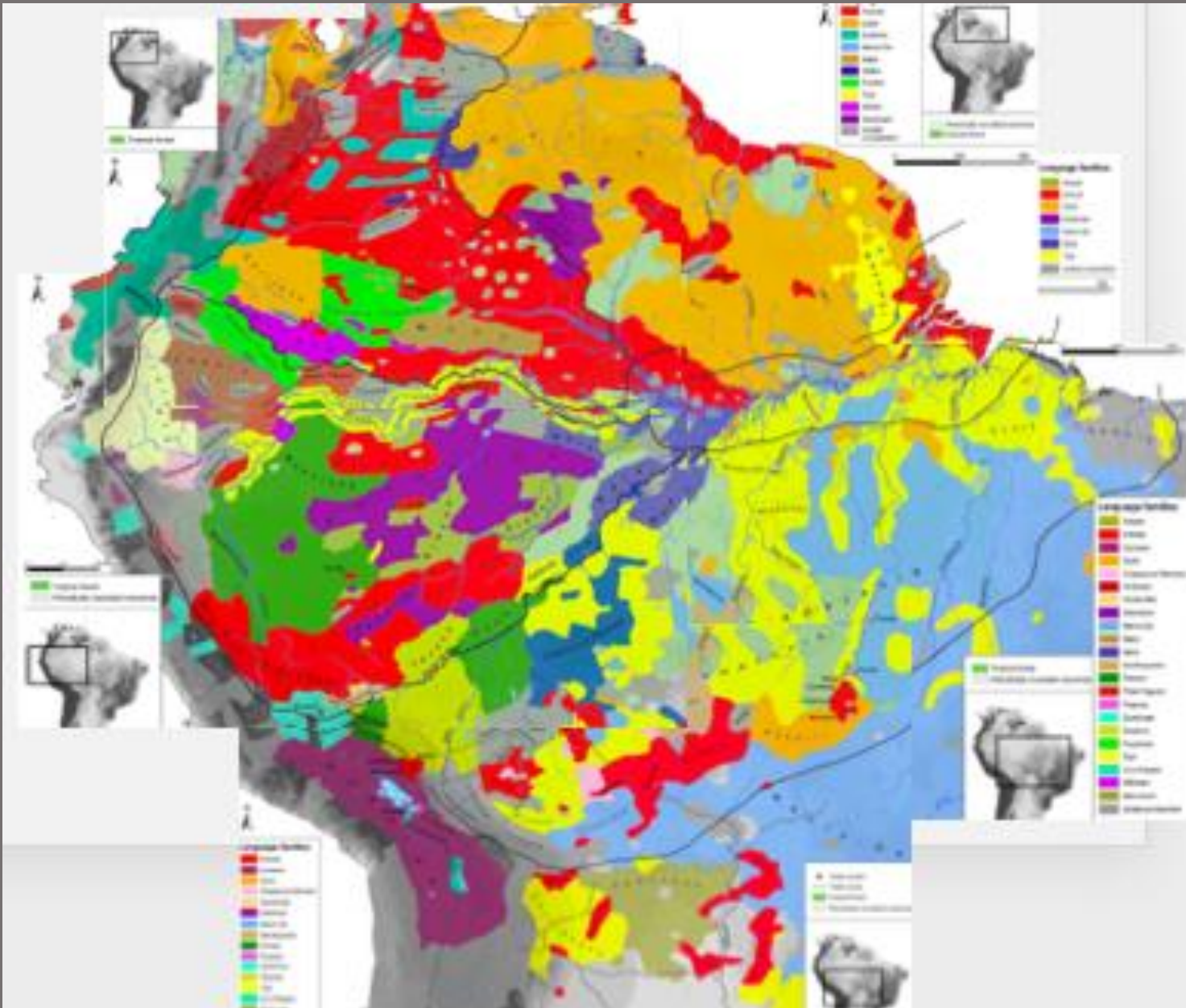


## Nature and Culture in Prehistoric Amazonia

Using G.I.S. to reconstruct ancient ethnogenetic processes from archaeology, linguistics, geography, and ethnohistory

# INDIGENOUS LANGUAGE FAMILIES IN THE AMAZON

(Eriksen 2011)





**OCUPAÇÃO INDÍGENA ANTIGA,**

**CENTRO INDEPENDENTE DE DOMESTICAÇÃO E CULTIVO DE  
PLANTAS,**

**MAIS DE UM CENTRO INDEPENDENTE DE INVENÇÃO DA  
CERÂMICA,**

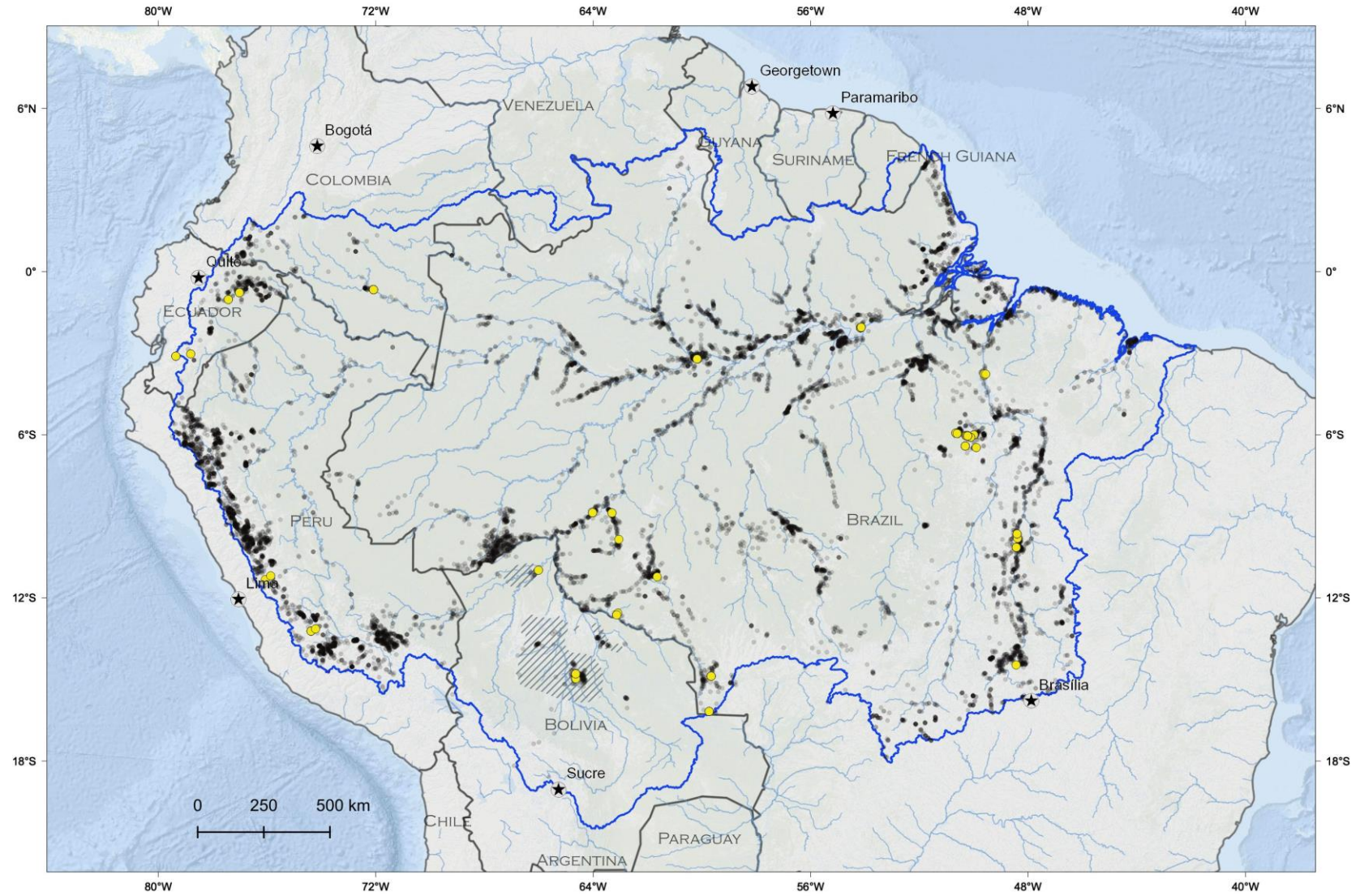
**TRANSFORMAÇÕES NA PAISAGEM – ADENSAMENTO  
DEMOGRÁFICO,**

**URBANISMO,**

**DIVERSIDADE CULTURAL**

**PRODUÇÃO DE ABUNDÂNCIA**

# EARLY ARCHAEOLOGICAL SITES IN AMAZONIA (>8200 yBP)



SPA, 2021

Sources: AmazonArch Database (Archaeological Sites - <https://sites.google.com/view/amazonarch>); Umberto Lombardo (Bolivian Raised Fields and Causeways); RAISG (reference boundaries, cities)

 Amazon Basin (SPA Limit)

 International Borders

 Early Archaeological Sites (>8200 yBP)

 Archaeological Sites

 Bolivian Raised Fields and Causeways

## Colonisation and early peopling of the Colombian Amazon during the Late Pleistocene and the Early Holocene: New evidence from La Serranía La Lindosa

Gaspar Morcote-Ríos<sup>a</sup>, Francisco Javier Aceituno<sup>b,\*</sup>, José Iriarte<sup>c</sup>, Mark Robinson<sup>c</sup>,  
Jeison L. Chaparro-Cárdenas<sup>a</sup>

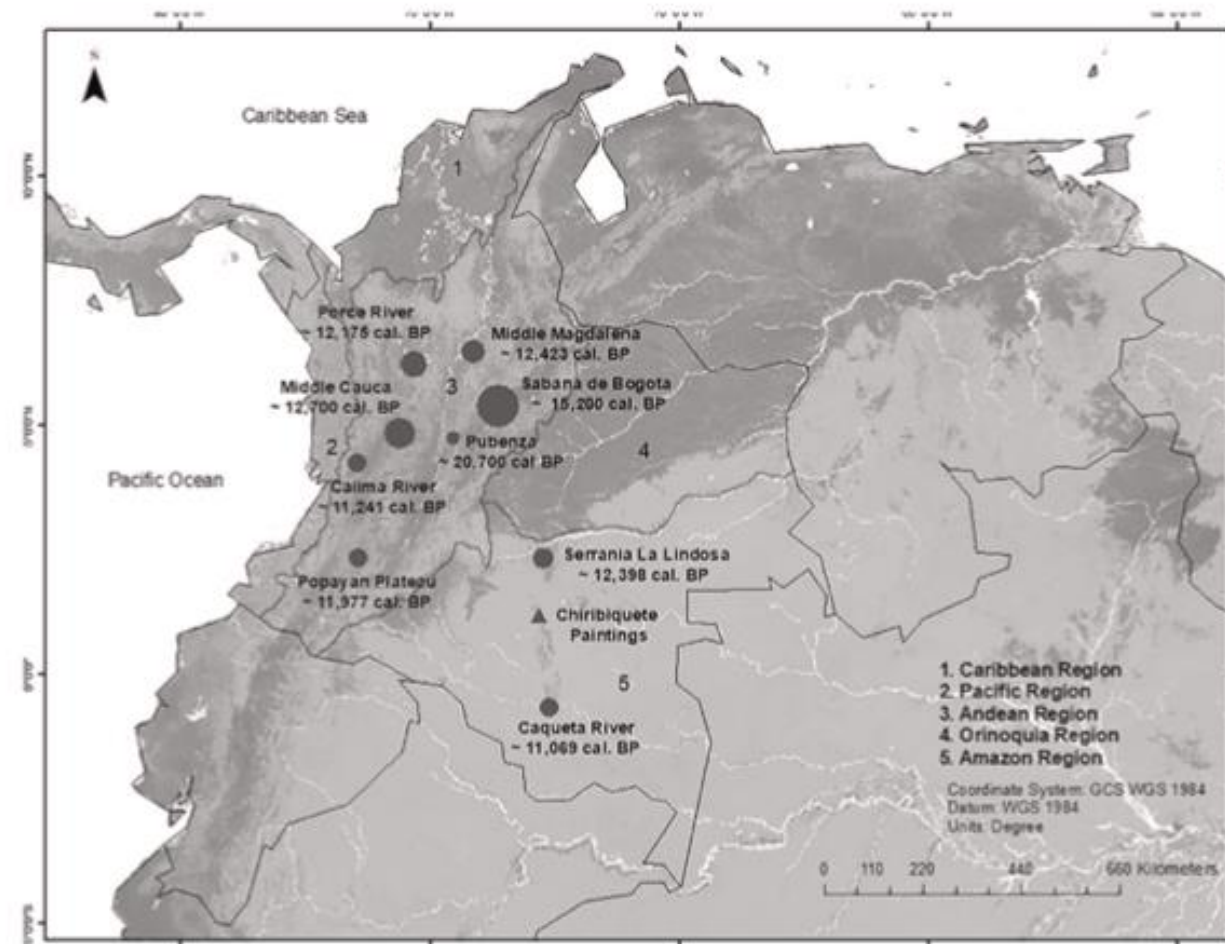


Fig. 2. Colombian archaeological areas showing the earliest archaeological sites with calibrated dates in each region.

# Colonisation and early peopling of the Colombian Amazon during the Late Pleistocene and the Early Holocene: New evidence from La Serranía La Lindosa

Gaspar Morcote-Ríos<sup>a</sup>, Francisco Javier Aceituno<sup>b,\*</sup>, José Iriarte<sup>c</sup>, Mark Robinson<sup>c</sup>, Jeison L. Chaparro-Cárdenas<sup>a</sup>

G. Morcote-Ríos et al.

Quaternary International xxx (xxxx) xxx



**Fig. 13.** Potential Ice-Age megafauna displayed in the pictographs of SLL including: a. giant sloth, b. mastodon, c. camelid (*Paleolama?*); d and e. horse; f. long-neck, three-toed ungulate with trunk (*Xenorhinotherium*, *Macrauchenia?*).

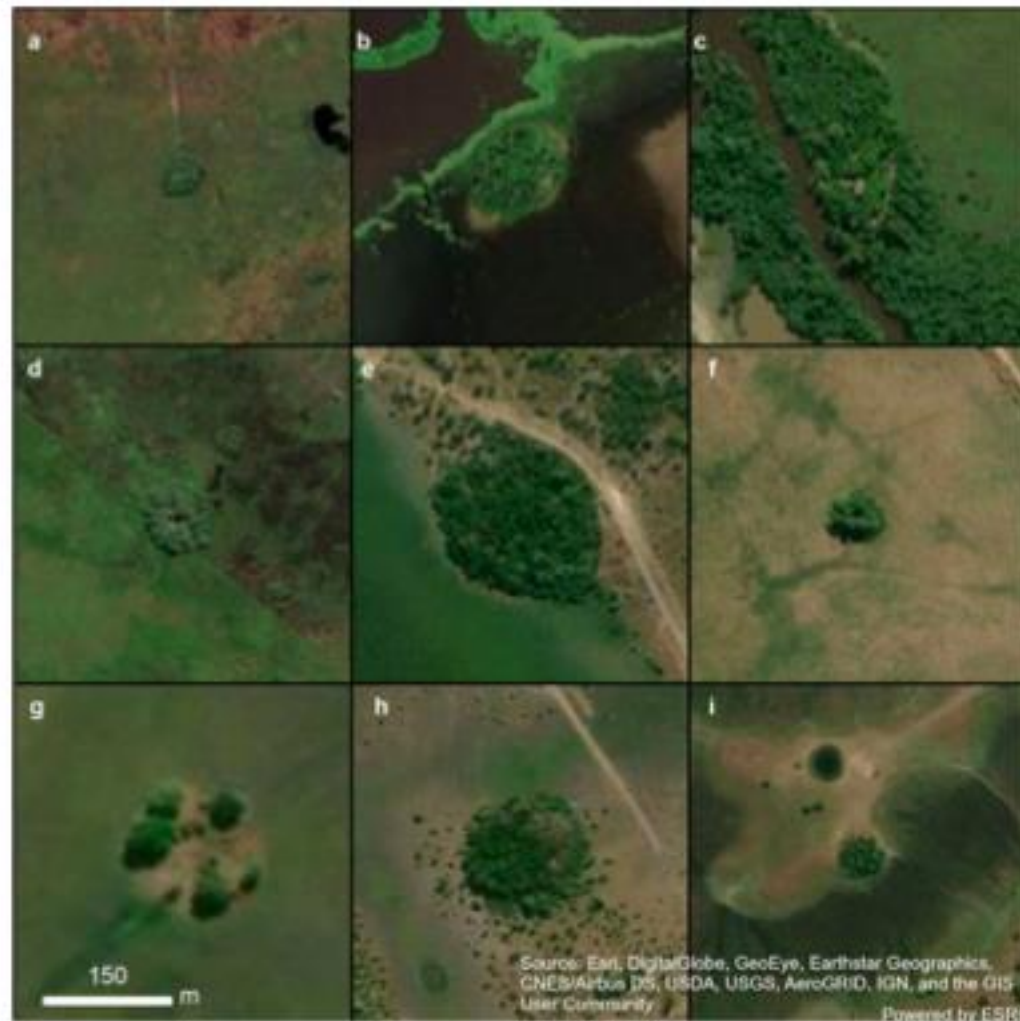
# Early Holocene crop cultivation and landscape modification in Amazonia

<https://doi.org/10.1038/s41586-020-2162-7>

Received: 21 November 2019

Umberto Lombardo<sup>1</sup>, José Iriarte<sup>2</sup>, Lautaro Hilbert<sup>3</sup>, Javier Ruiz-Pérez<sup>4</sup> & Heinz Veit<sup>1</sup>

## Article



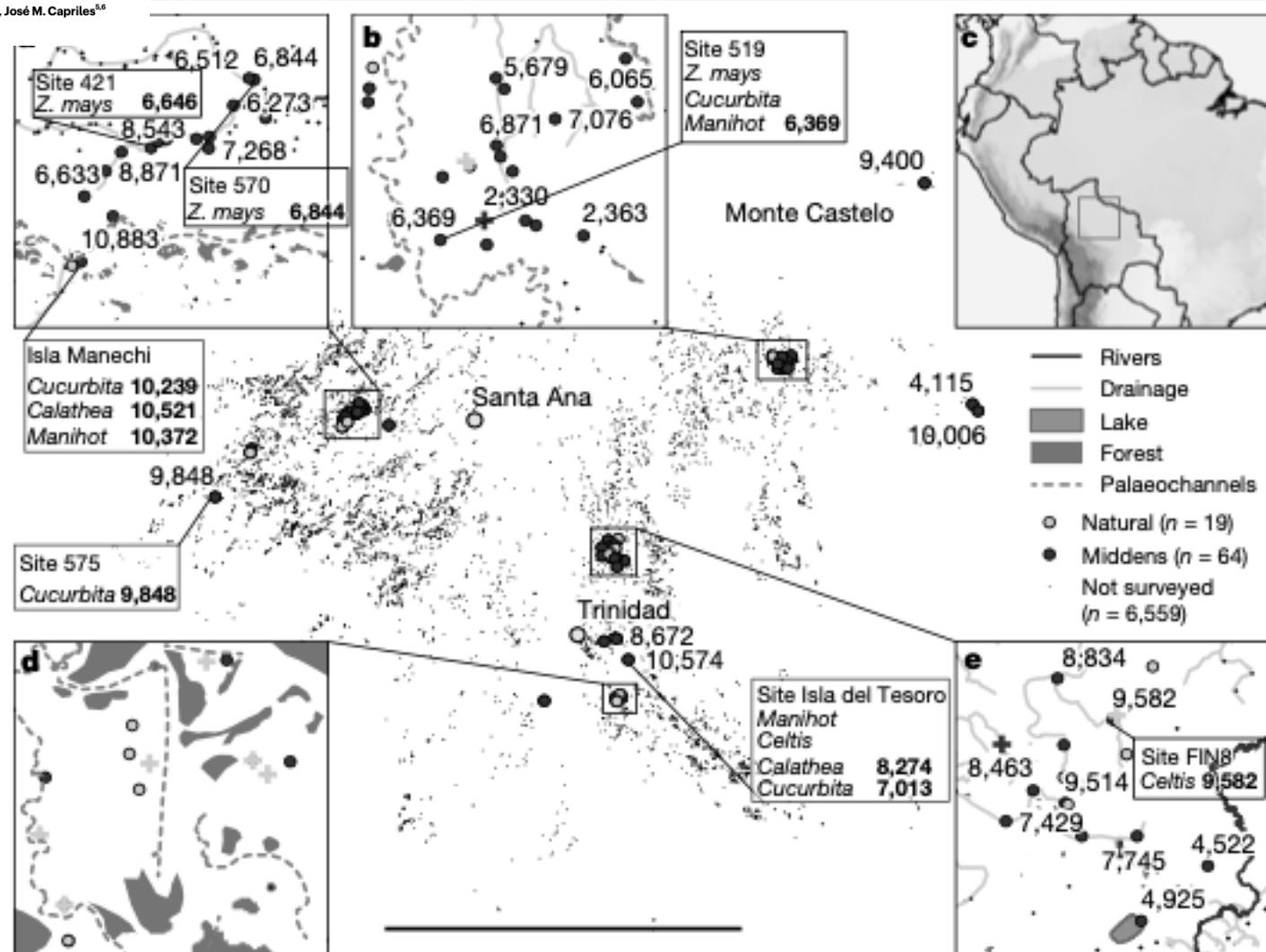
**Extended Data Fig. 5 | Examples of surveyed forest islands as seen in high-resolution satellite imagery from the Esri ArcGIS base map. a–f, Forest islands classified as anthropic (a, Isla San Pablo (SM4); b, Isla Manechi; c, site 575; d, Isla La Chacra (SM3); e, site FIN12; and f, Isla del Tesoro (SM1)).**

**g–i, Forest islands classified as natural (g, site FIN2; h, site FIN11; and i, site 529). Source for the maps, ESRI, DigitalGlobe, GeoEye, Earthstar Geographics and CNES/Airbus DS.**

# Early Holocene crop cultivation and landscape modification in Amazonia

<https://doi.org/10.1038/s41586-020-2162-7>  
Received: 21 November 2019

Umberto Lombardo<sup>1,2</sup>, José Iriarte<sup>2</sup>, Lautaro Hilbert<sup>2</sup>, Javier Ruiz-Pérez<sup>2</sup>, José M. Capriles<sup>3,4</sup> & Heinz Veit<sup>1</sup>



**Fig. 1 | Forest islands mapped in the Llanos de Moxos.** The numbers associated with middens are dates expressed in median cal. yr BP from the deepest anthropic datable layer at each site (Extended Data Table 1). **a, b, d, e,** Areas that

Llanos de Moxos (Extended Data Fig. 1). **c,** Large-scale map, identifying the study area (square) and Greater Amazonia (grey shaded area). The Andes is shown in dark grey. Circles, round forest islands; crosses, irregular forest islands (see

# INDEPENDENT CENTERS OF PLANT DOMESTICATION (Smith 2006)

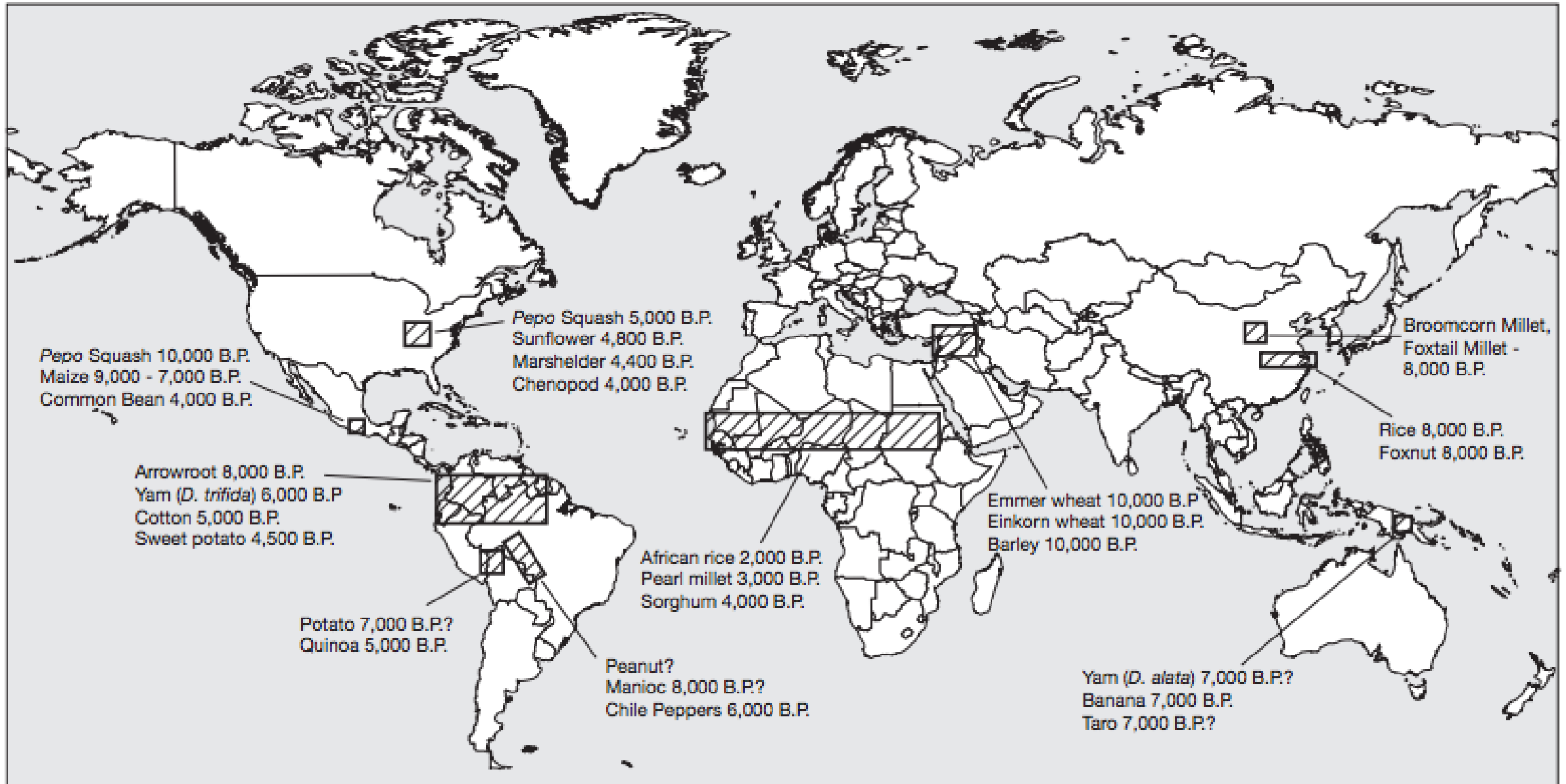


Fig. 1. Currently recognized independent centers of plant and animal domestication.



Sítio  
Teotônio

Cachoeira do Teotônio durante a cheia. Foto: Luiz Claudio Marigo.

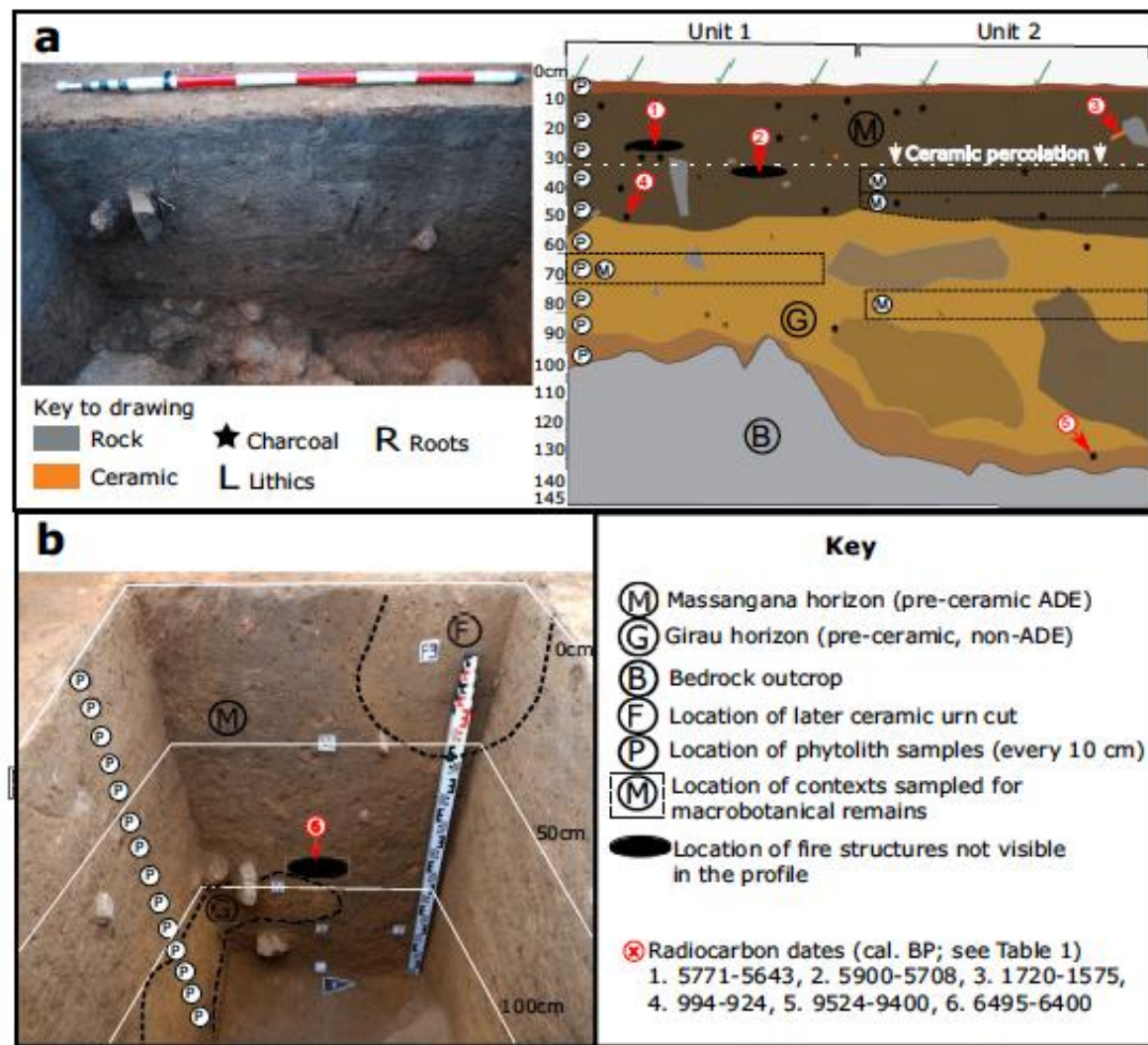


# SÍTIO TEOTÔNIO, PORTO VELHO (RO) – EDUARDO NEVES



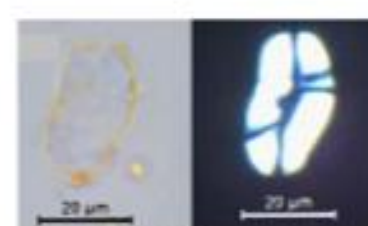
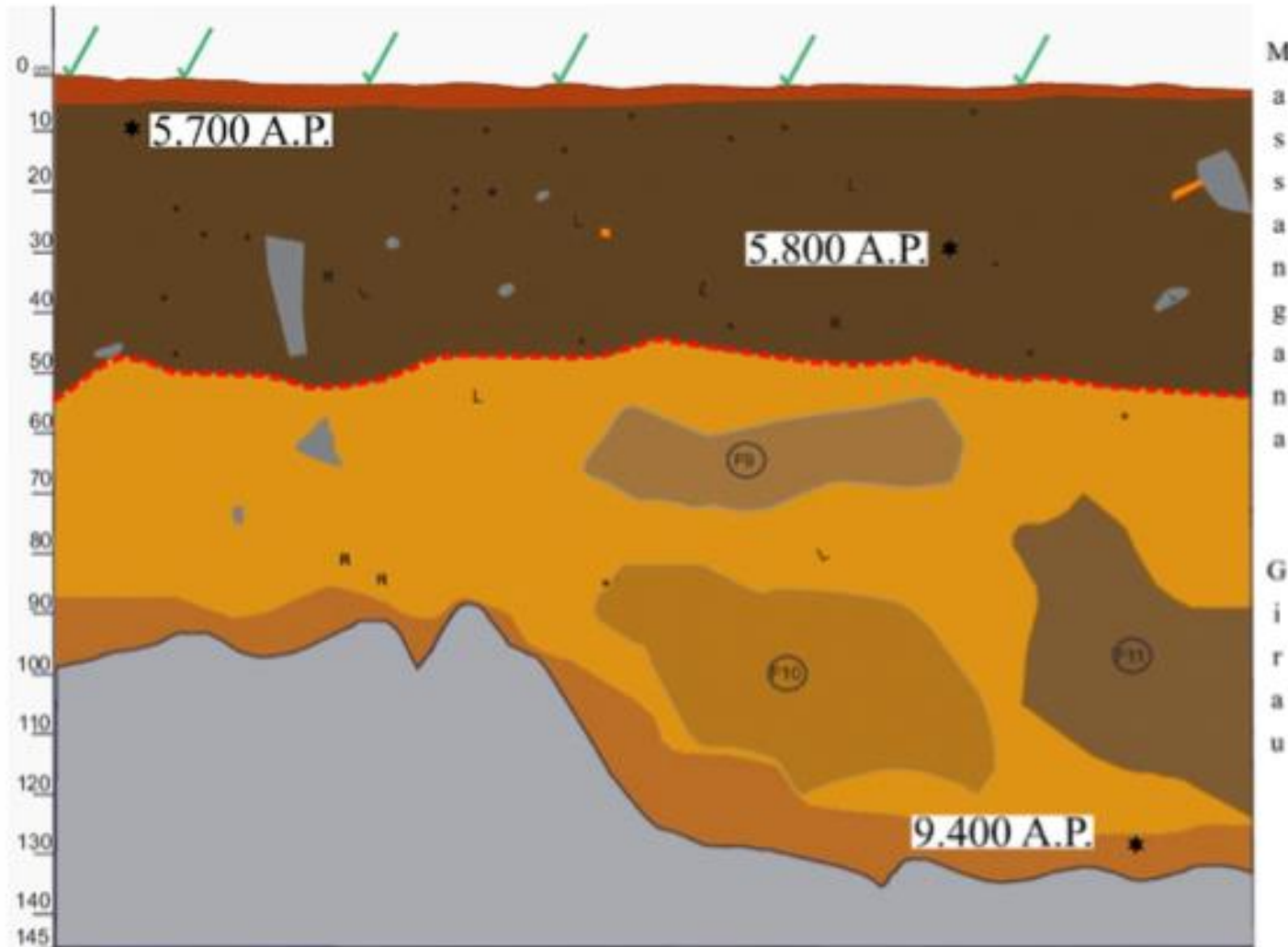
# Direct archaeological evidence for Southwestern Amazonia as an early plant domestication and food production centre

Jennifer Watling<sup>1\*</sup>, Myrtle P. Shock<sup>2</sup>, Guilherme Z. Mongeló<sup>1</sup>, Fernando O. Almeida<sup>3</sup>, Thiago Kater<sup>3</sup>, Paulo E. De Oliveira<sup>4,5</sup>, Eduardo G. Neves<sup>1</sup>

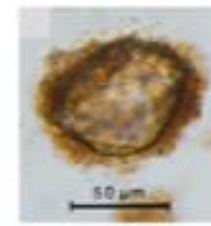


**Fig 3.** Images of excavated pre-ceramic units at Teotonio highlighting their stratigraphy, the location of radiocarbon dates, and the origin of archaeobotanical samples. a) Photograph and drawing of east-facing profiles of Units 1 and 2 (Arqueotrop, MAE, 2016), b) Photograph of east-facing profile of Unit 5 (Arqueotrop, MAE, 2011), with the relevant stratigraphic information projected upon it. Phytolith samples were taken from the north-facing profile.

## Sítio Arqueológico Teotônio



Feijão  
(*Phaseolus* sp.)



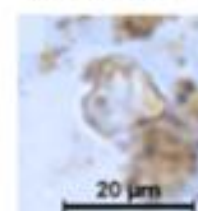
Abóbora  
(*Cucurbita* sp.)



Feijão  
(*Phaseolus / Vigna* sp.)



Patuá / Bacaba  
(*Oenocarpus* sp.)



Mandioca  
(*Manihot esculenta*)



Ariá  
(*Callathea* sp.)



Goiaba  
(*Psidium* sp.)



Castanha  
(*Bertholletia excelsa*)



Pequiá  
(*Caryocar* sp.)

**Figura 1.** Plantas cultivadas no Holoceno Inicial e Holoceno Médio, sítio Teotônio, Alto Rio Madeira, Porto Velho, RO. Fonte: Watling *et al.* (2018).

# A AMAZÔNIA É UM CENTRO DE AGROBIODIVERSIDADE





**CASTANHEIRA,  
PONTA DA  
CASTANHA,  
LAGO TEFÉ,  
AMAZONAS**

(FOTO E.

NEVES)



Daniel Cangussu e a Batata da fartura no Vale do Mucuri



Daniel Cangussu e a *Casimirela ampla* no sul do Amazonas

## Amazônia indomável: relações fora do alcance da domesticação

*Unruly Amazon: relations out of range to the idea of domestication*  
*Amazonia indomable: relaciones fuera del alcance de la domesticación*

Gilton Mendes dos Santos  
Guilherme Henriques Soares



**Figura 2:** Batata mairá (*Casimirella* sp). Foto Valdely Kinnupi







# Hyperdominance in the Amazonian Tree Flora

Hans ter Steege\* *et al.*

READ THE FULL ARTICLE ONLINE

<http://dx.doi.org/10.1126/science.1243092>



Cite this article as H. ter Steege *et al.*,  
*Science* **342**, 1243092 (2013).  
DOI: 10.1126/science.1243092

$3.9 \times 10^{11}$  (390 BILHÕES) DE ÁRVORES NA  
AMAZÔNIA,

16.000 ESPÉCIES DE ÁRVORES NA AMAZÔNIA,

SÓ 227 (1.4%) DAS 16,000 ESPÉCIES  
TOTALIZAM QUASE A METADE DE TODAS AS  
ÁRVORES – **HIPERDOMINÂNCIA**.

# HYPERDOMINANT TREE SPECIES

- 6 OF THE 10 MOST HYPERDOMINANT ARE PALMS:
  - (1) *Euterpe precatoria* ('açai-do-mato'), (5) *Iriarteia deltoidea* ('paxiubão'), (6) *Euterpe oleracea* ('açai-do-Pará'), (7) *Oenocarpus bataua* ('patauá'), (9) *Socratea exorrhiza* ('paxiuba') and (10) *Astrocaryum murumuru* ('murumuru').

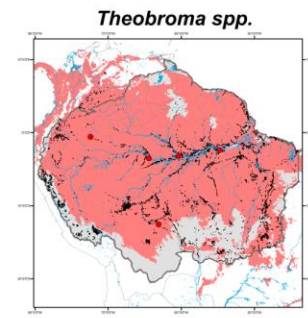
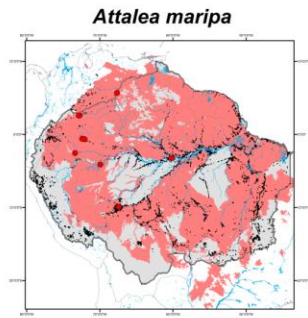
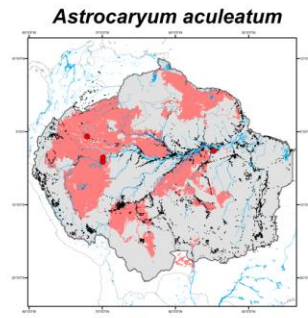
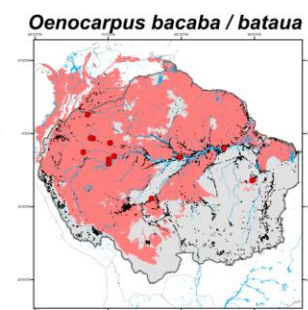
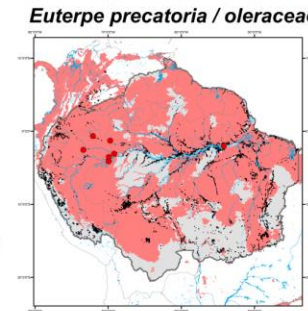
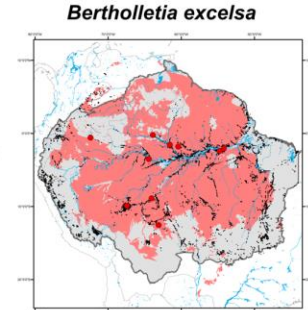
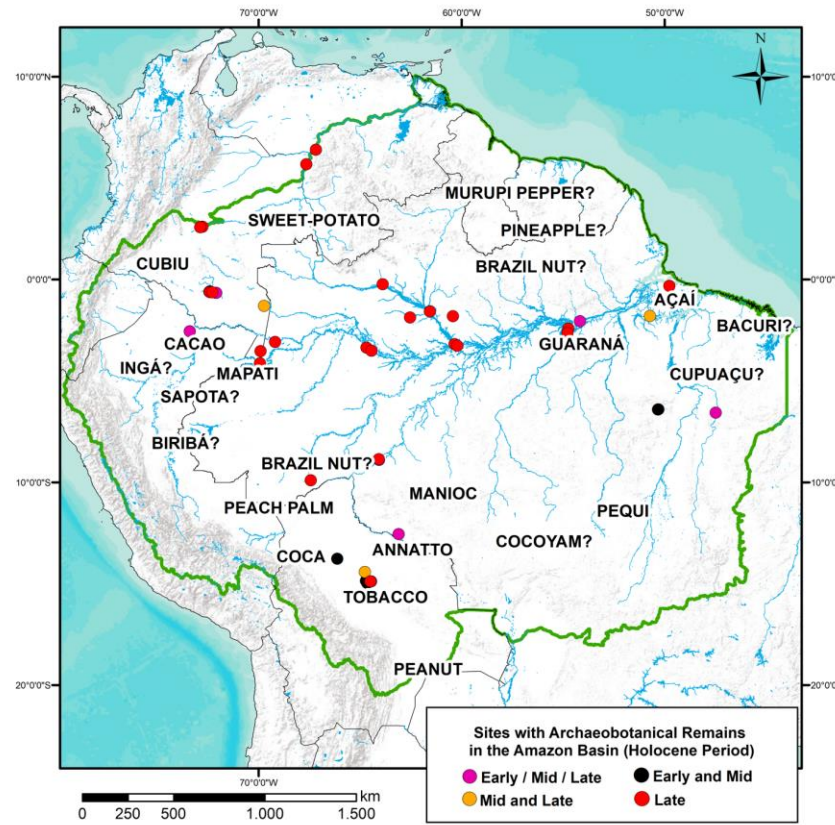
# AÇAÍ PALM GROVE, CENTRAL AMAZON (E. Neves)



## Persistent effects of pre-Columbian plant domestication on Amazonian forest composition

The extent to which pre-Columbian societies altered Amazonian landscapes is hotly debated. We performed a basin-wide analysis of pre-Columbian impacts on Amazonian forests by overlaying known archaeological sites in Amazonia with the distributions and abundances of 85 woody species domesticated by pre-Columbian peoples. Domesticated species are five times more likely than nondomesticated species to be hyperdominant. Across the basin, the relative abundance and richness of domesticated species increase in forests on and around archaeological sites. In southwestern and eastern Amazonia, distance to archaeological sites strongly influences the relative abundance and richness of domesticated species. Our analyses indicate that modern tree communities in Amazonia are structured to an important extent by a long history of plant domestication by Amazonian peoples.

# Plant Domestication Centers and Hyperdominant Species in Archaeological Context

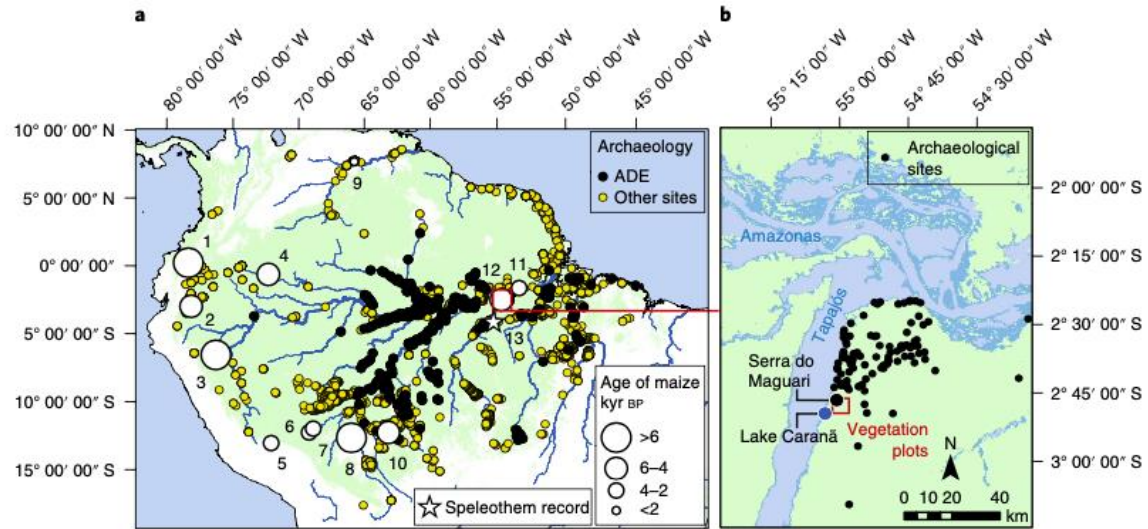


Distribution of *T. bicolor* / cacao grandiflorum / obovatum speciosum / subcanum



# The legacy of 4,500 years of polyculture agroforestry in the eastern Amazon

S. Yoshi Maezumi<sup>1\*</sup>, Daiana Alves<sup>1</sup>, Mark Robinson<sup>1</sup>, Jonas Gregorio de Souza<sup>1</sup>, Carolina Levis<sup>2,3</sup>, Robert L. Barnett<sup>4</sup>, Edemar Almeida de Oliveira<sup>5</sup>, Dunia Urrego<sup>4</sup>, Denise Schaan<sup>6</sup> and José Iriarte<sup>1</sup>



**Fig. 1 | Regional study area. a**, Map showing the Amazonian pollen, archaeological site<sup>94,95</sup> and records documenting the early presence of maize: (1) Lake San Pablo, (2) Lake Ayauch, (3) Lake Sauce, (4) Abeja, (5) Huaypo, (6) Puerto Maldonado, (7) Lake Gentry, (8) Lake Rogaguado, (9) Parmana, (10) Monte Castelo, (11) Geral, (12) Lake Caranã (Supplementary Table 1) and (13) the location of the Paraíso Cave speleothem record. **b**, The Santarém region showing the location of Lake Caranã and the SDM1 archaeological site<sup>50</sup>.

# EARLY CERAMICS IN SOUTH AMERICA





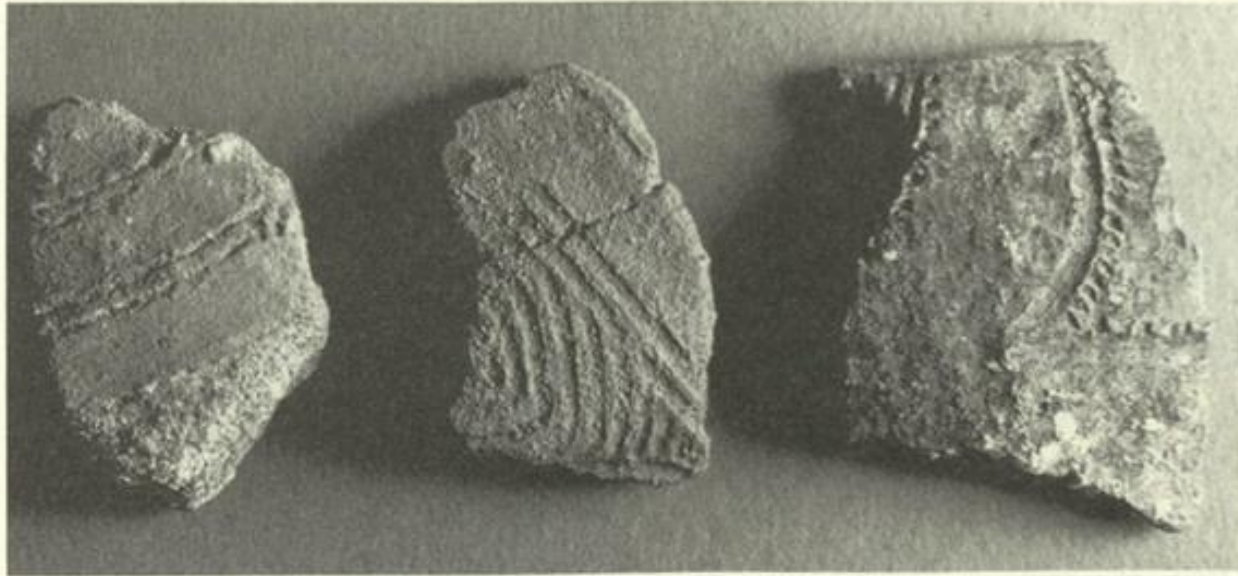


Fig. 10.3. Incised sand-tempered pottery sherds from Taperinha shell mound.

REPORTS

## Eighth Millennium Pottery from a Prehistoric Shell Midden in the Brazilian Amazon

A. C. ROOSEVELT<sup>1</sup>, R. A. HOUSLEY<sup>2</sup>, M. IMAZIO DA SILVEIRA<sup>3</sup>, S. MARANCA<sup>4</sup>, R. JOHNSON<sup>5</sup>

+ Author Affiliations

*Science* 13 Dec 1991:  
Vol. 254, Issue 5038, pp. 1621-1624  
DOI: 10.1126/science.254.5038.1621



## A CERÂMICA MINA NO ESTADO DO PARÁ: OLEIRAS DAS ÁGUAS SALOBRAS DA AMAZÔNIA

Elisângela Regina de Oliveira  
Maura Imazio da Silveira

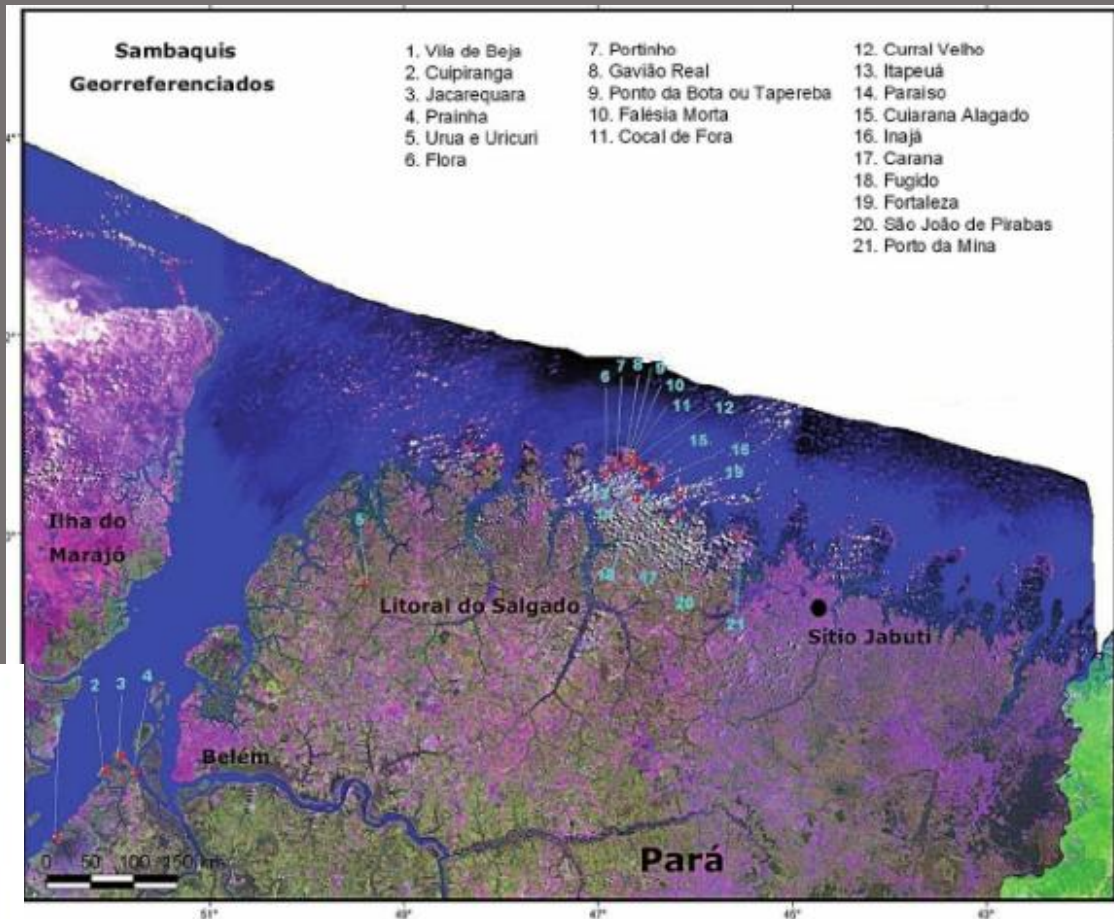


Figura 2. Aspectos do trabalho de campo no sítio PA-SA-05; Porto da Mina. a) Abertura de corte estratigráfico (Foto: Mário Simões, 1968. Acervo MPEC). b) Coleta de amostras para análise de pólen no perfil da Quadra I (Foto: Mário Simões, 1968. Acervo MPEC).



**Sambaqui Porto da Mina, Pará**  
(foto Paulo do Canto)

A CERÂMICA MINA NO ESTADO DO PARÁ:  
OLEIRAS DAS ÁGUAS SALOBRAS DA AMAZÔNIA

Elisângela Regina de Oliveira  
Maura Imazio da Silveira

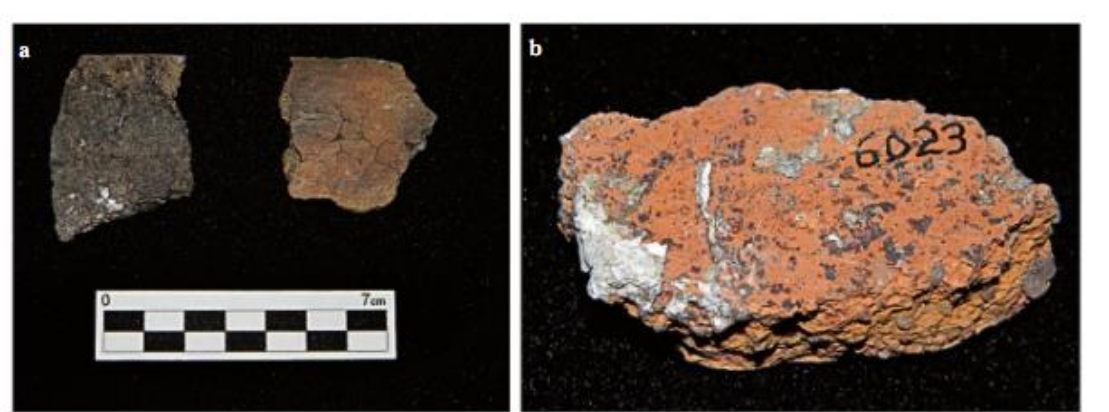


Figura 4. Fragmentos cerâmicos provenientes do sambaqui fluvial Taperinha, Baixo Amazonas. 4a) Dois fragmentos de borda com decoração plástica (incisões e entalhe no lábio) coletados por Charles F. Hartt em 1871 (Foto: Elisângela Oliveira. Acervo MPEG). 4b) Detalhe da pasta (com grande quantidade de antiplástico mineral) de um fragmento cerâmico coletado por Anna Roosevelt e equipe durante escavação realizada em 1987 (Foto: Elisângela Oliveira. Acervo MPEG).

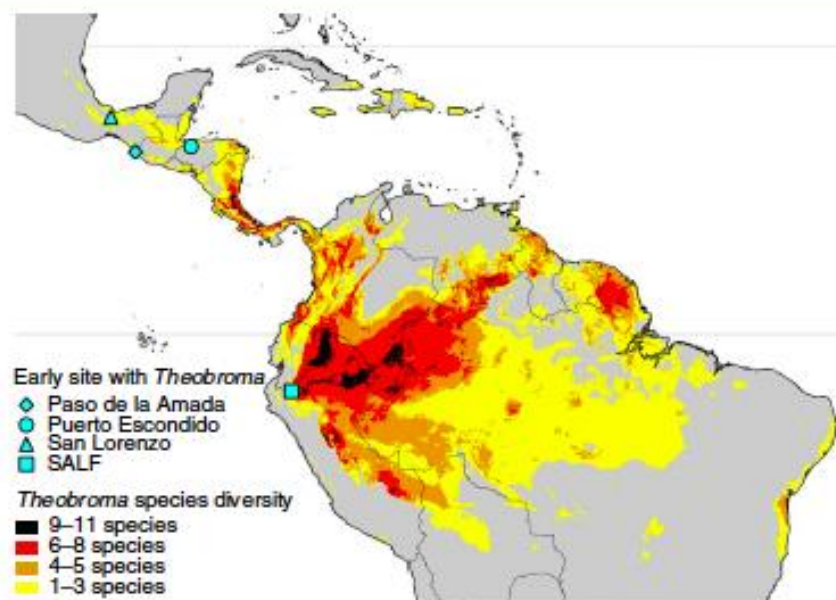


# The use and domestication of *Theobroma cacao* during the mid-Holocene in the upper Amazon

Sonia Zarrillo<sup>1,2,3\*</sup>, Nilesh Gaikwad<sup>2,4,5</sup>, Claire Lanaud<sup>4,6,7</sup>, Terry Powis<sup>7</sup>, Christopher Viot<sup>4,6</sup>, Isabelle Lesur<sup>4,9</sup>, Olivier Fouet<sup>4,6</sup>, Xavier Argout<sup>4,6</sup>, Erwan Guichoux<sup>8</sup>, Franck Salin<sup>9</sup>, Rey Loor Solorzano<sup>10</sup>, Olivier Bouchez<sup>11</sup>, H el ene Vignes<sup>4,6</sup>, Patrick Severtz<sup>12</sup>, Julio Hurtado<sup>13</sup>, Alexandra Yopez<sup>14</sup>, Louis Grivetti<sup>15</sup>, Michael Blake<sup>16\*</sup> and Francisco Valdez<sup>18</sup>

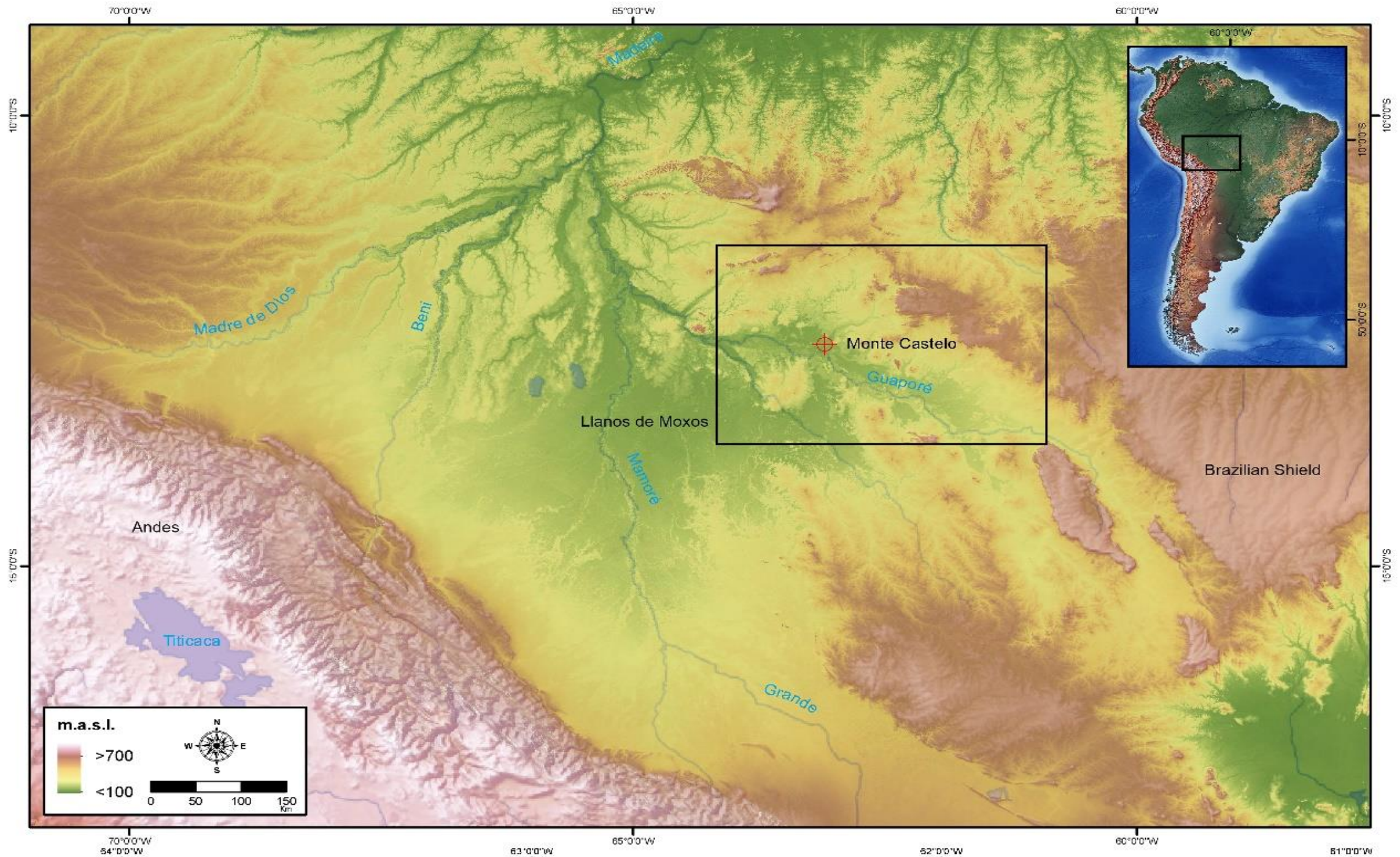
## ARTICLES

## NATURE ECOLOGY & EVOLUTION



**Fig. 1 |** Locations of the four archaeological sites in Mexico, Central America and South America with the earliest evidence of *Theobroma* use, as well as the species diversity distributions for the genus *Theobroma*<sup>17,19,58</sup>. The zone surrounding SALF has six known native species of *Theobroma*: *T. bicolor*; *T. sinuosum*; *T. speciosum*; *T. subincanum*; *T. stipulatum*; *T. glaucum*<sup>58</sup>. The species diversity map is derived from ref. <sup>17</sup> and is modelled using species observations extracted from GBIF<sup>58</sup>. We reduced the modelled continuous 1–11 species diversity range of Thomas et al.<sup>17</sup> to four categories: 1–3, 4–5, 6–8 and 9–11 species.





**THE ISLAND ON THE FOREGROUND IS MONTE CASTELO SHELLMOUND  
IN THE DRY SEASON**



# SAMBAQUI MONTE CASTELO NA ESTAÇÃO CHUVOSA









# MONTE CASTELO, 2020

(FOTO E. NEVES)



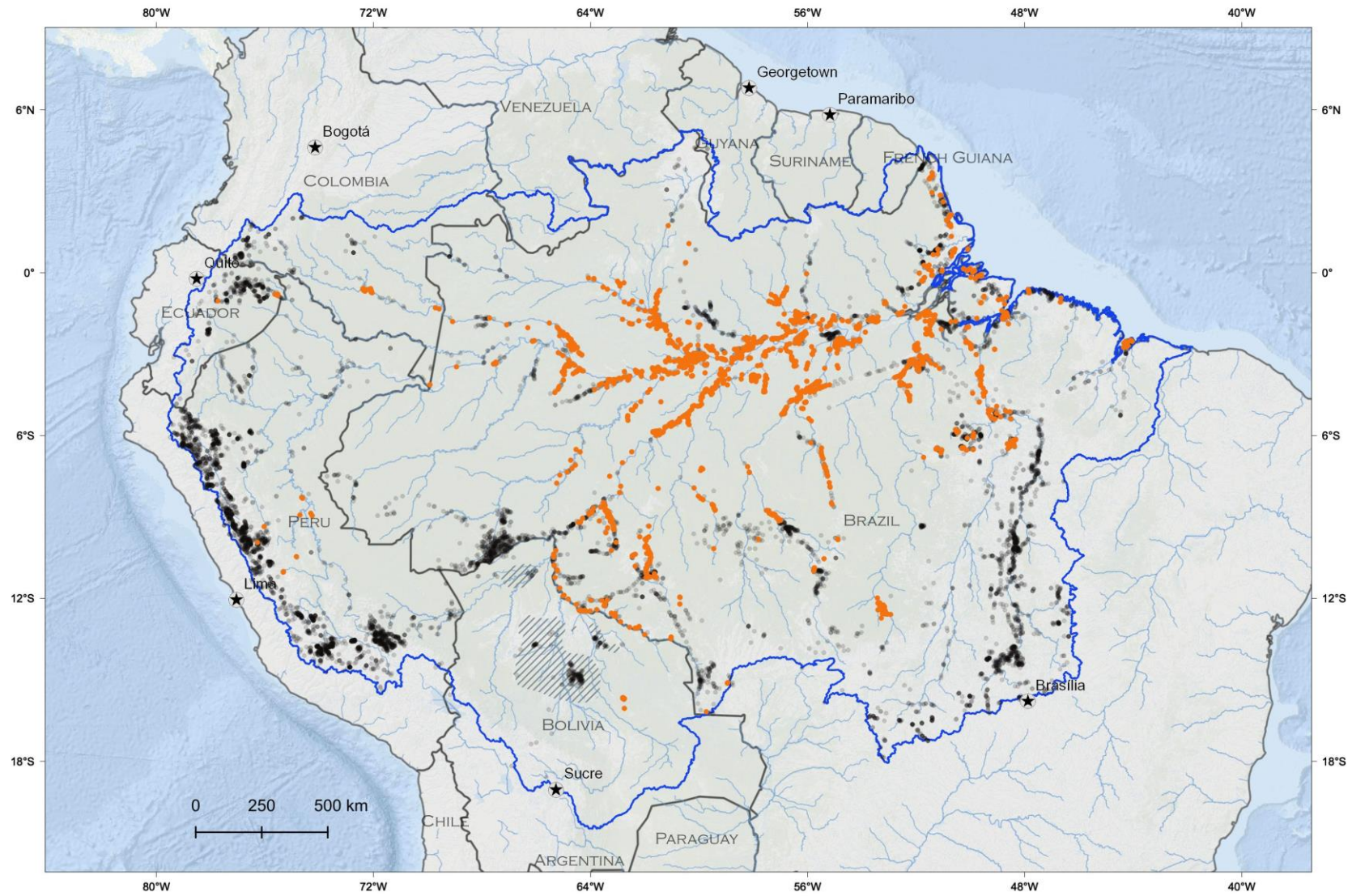


# CERAMICS, FAUNAL E PLANT REMAINS, MONTE CASTELO,

(FOTO E. NEVES)



# AMAZONIAN ANTHROPOGENIC SOILS



SPA, 2021

Sources: AmazonArch Database (Archaeological Sites - <https://sites.google.com/view/amazonarch>); Umberto Lombardo (Bolivian Raised Fields and Causeways); RAISG (reference boundaries, cities)

Amazon Basin (SPA Limit)

International Borders

Anthropogenic soils

Archaeological Sites

Bolivian Raised Fields and Causeways



IV

III

II

F40

F41

I

AC AM - IA - 48  
L. LAGUINHO  
1063 1064 1065  
E965 N.O-190CM  
PERFIL W.  
13-08-07

ANTHROPIC DARK EARTHS, CENTRAL AMAZON,  
VII CE, CENTRAL AMAZON (FOTO E. NEVES)



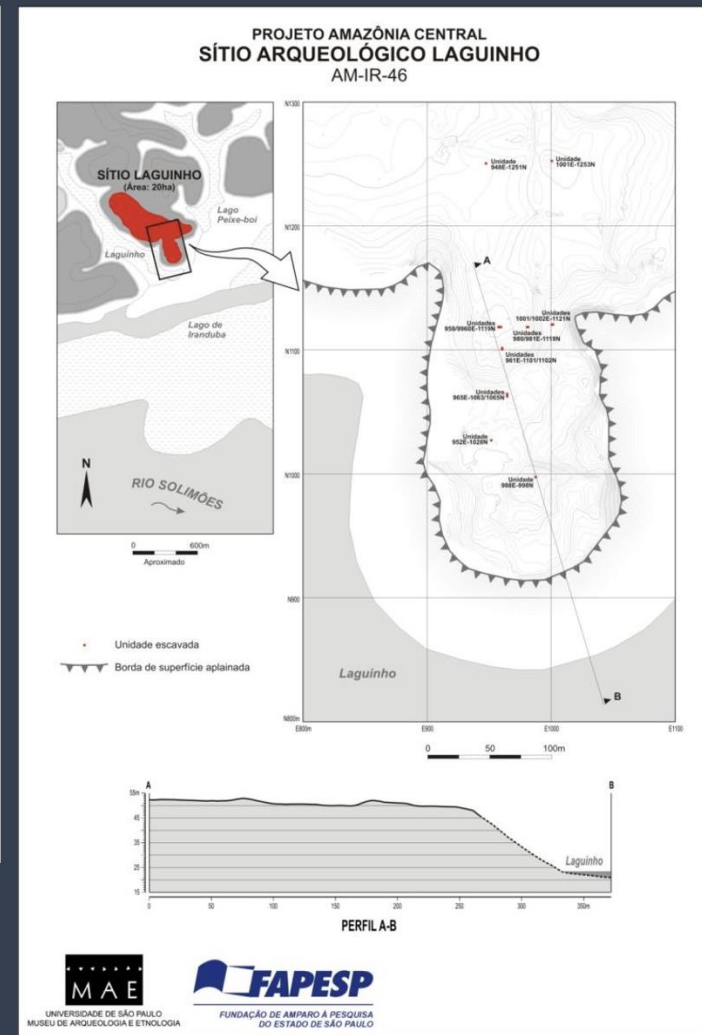
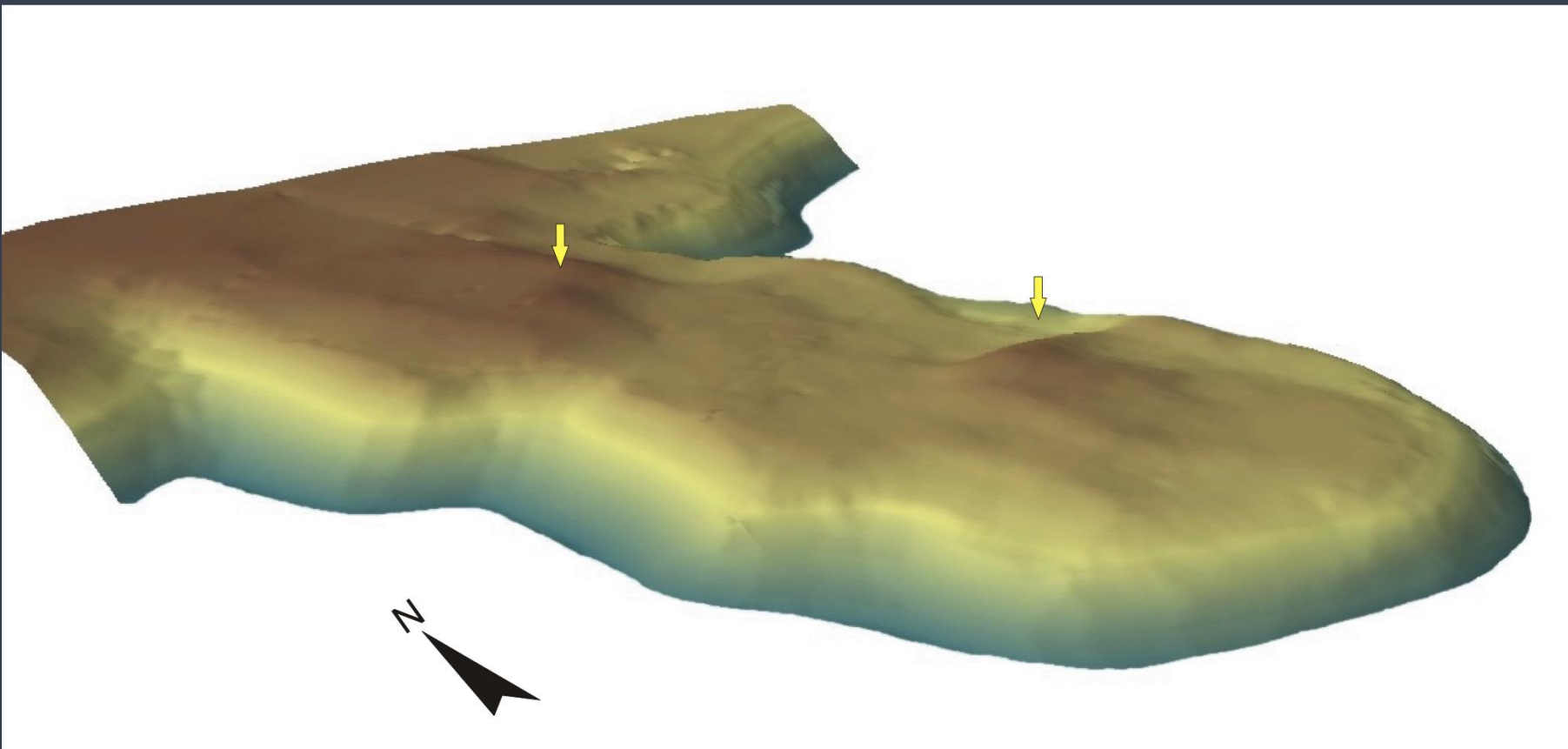
**PAPAYA PLANTATION ON ARCHAEOLOGICAL SITE WITH ADE (foto E. Neves)**



# LAGUINHO SITE, CENTRAL AMAZON CE 700 – 1,000 (Castro 2009)



# MOUNDS AND PLATFORMS, LAGUINHO SITE (Castro & Schmidt 2009)



Sepultamento humano em contexto de terra preta, sítio Hatahara, Iranduba (AM), ca. 700 DC (foto Val Moraes)





TENHARIM MARMELOS (GLEBA B)

Humaitá

230

TENHARIM MARMELOS

**MAIZE GARDEN ON  
ARCHAEOLOGICAL SITE WITH  
ADE,  
TI TENHARIM-MARMELOS  
(AM), FOTO E. NEVES**



What SARS-CoV-2's mild cousins reveal about COVID-19 p. 141

Specifying laws of friction pp. 150 & 200

Continued decline of sharks despite regulation p. 225

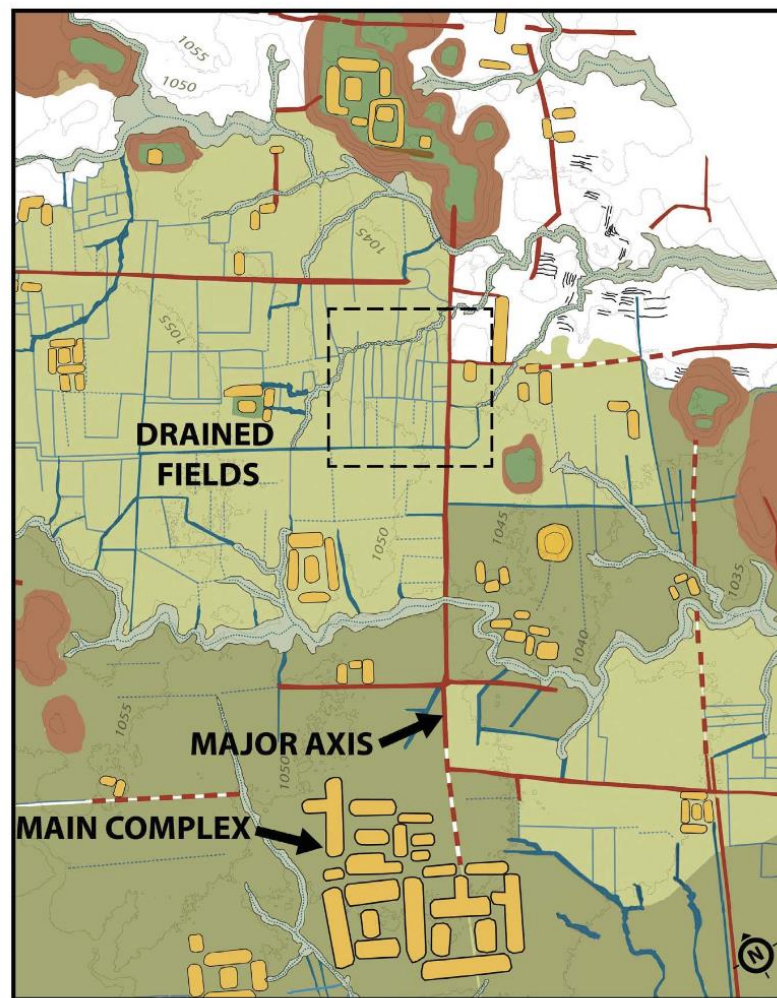
# Science

\$15  
12 JANUARY 2024  
science.org



# LOST CITY

Ancient development in the Upper Amazon p. 183



### ANTHROPOGENIC FEATURES

#### Built features

- Platform
- Terrace

#### Road network

- Excavated footpath
- Uncertain Excavated footpath

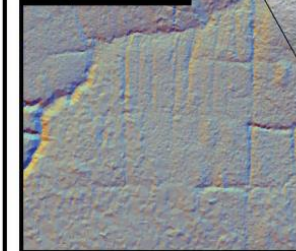
#### Fields and drainage system

- Drained field
- Possible drained field area
- Drained field limit
- Uncertain drained field limit
- Drainage channel

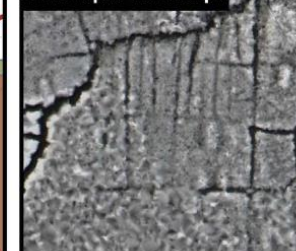
### GEOMORPHIC FEATURES AND ANTHROPIZED LANDFORMS

- Gully (intermittent stream)
- Main hill
- Concave hillslope
- Truncated hill
- Contour line

#### Multiple hillshades

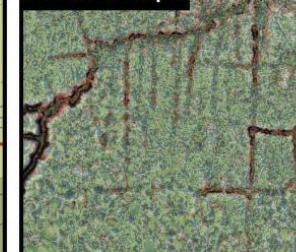


#### SLRM10px > SLRM50px



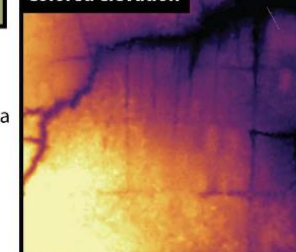
convex concave

#### Reclassified slopes



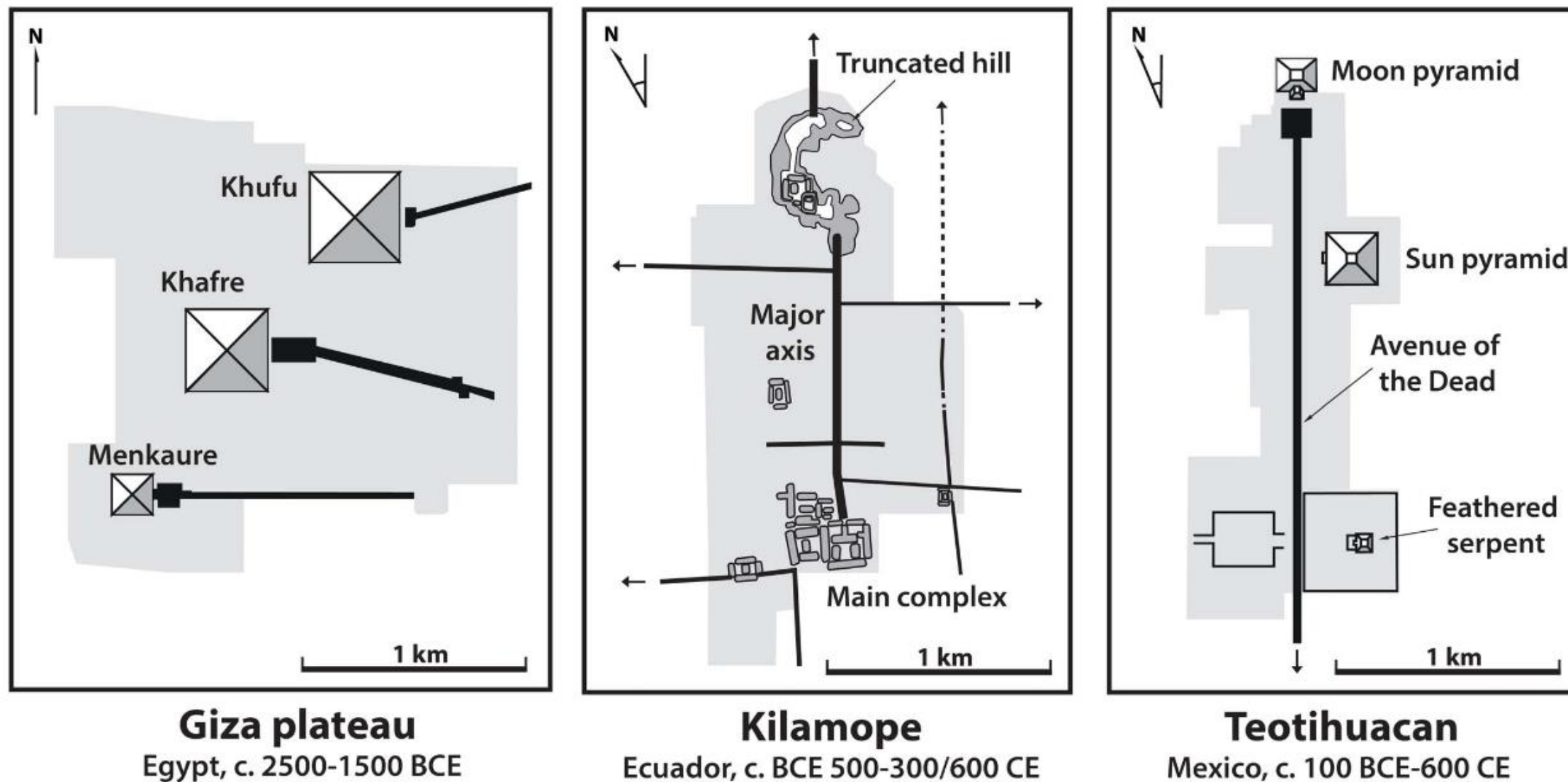
<0.5 0.5-2 2-5 5-10 10-15 15-20 >20°

#### Colored elevation



1044 1052 m

200 m



**Fig. 5. Comparison of site sizes.** Comparison at the same scale of the core areas of major sites of the Upano, ancient Egypt, and ancient Mesoamerica (for comparison with low-density urbanism sites in Amazonia, see supplementary text S4 and fig. S12).

# LIDAR AND ARCHAEOLOGY



## WHAT IS LIDAR?

LiDAR stands for Light Detection And Ranging, a technology invented in the 1960s. It is a remote sensing technology system that collects data about ranges, or distances, using lasers. It has a number of benefits:

- It can more easily collect data over a large area.
- It can be used to create maps.
- It can map areas that are not visible to the human eye.

Because of its special features, LiDAR is now being used by archaeologists.

## UNCOVERING TIKAL

Because of its ability to “see” through a tree canopy, airborne LiDAR is of particular use in archaeology. For example, at the Tikal site in Guatemala, aerial photography can only show some of the buildings. LiDAR reveals what is under the canopy, helping archaeologists learn more about the area’s agriculture, population size, and other aspects of the Mayan civilization that they did not know before.

## MAIN PARTS OF AN AIRBORNE LIDAR SYSTEM

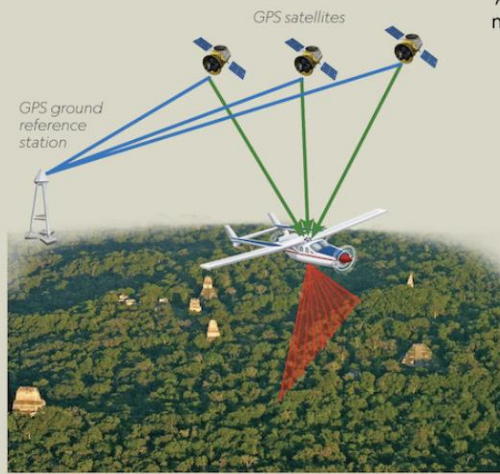
Plane/Helicopter/Drone—carries the moving technology

Laser—sends out an echo pulse

Laser Sensor—detects the reflected pulse to measure the range

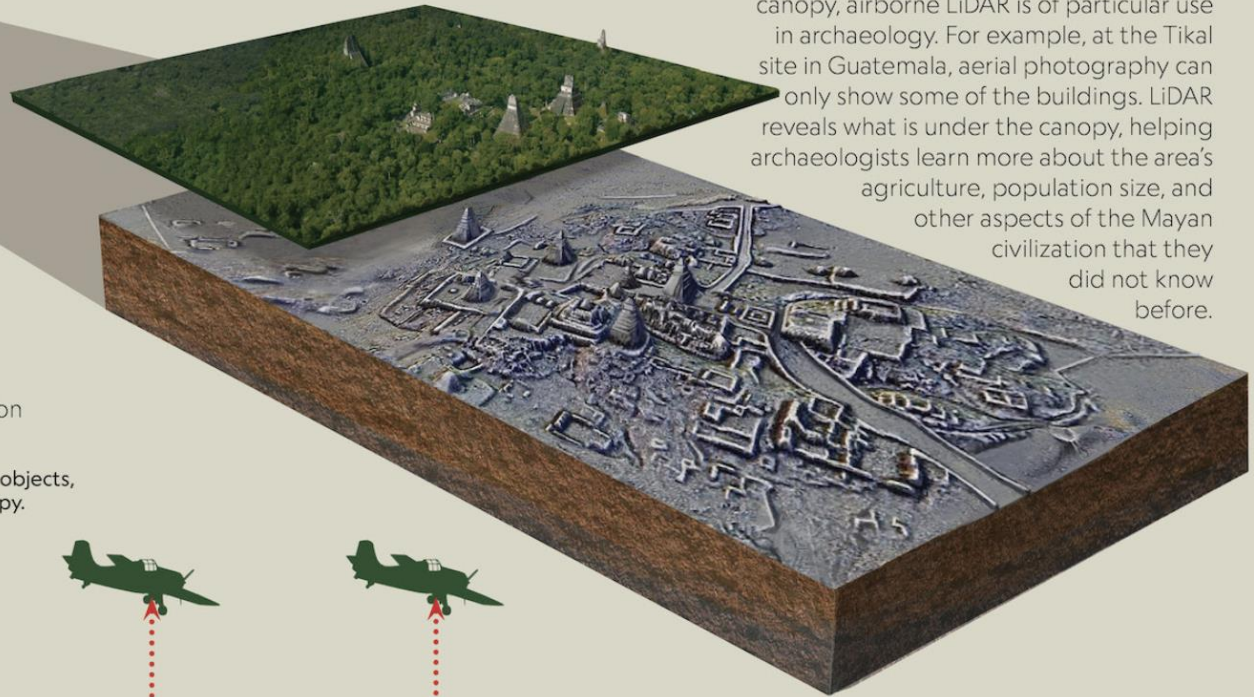
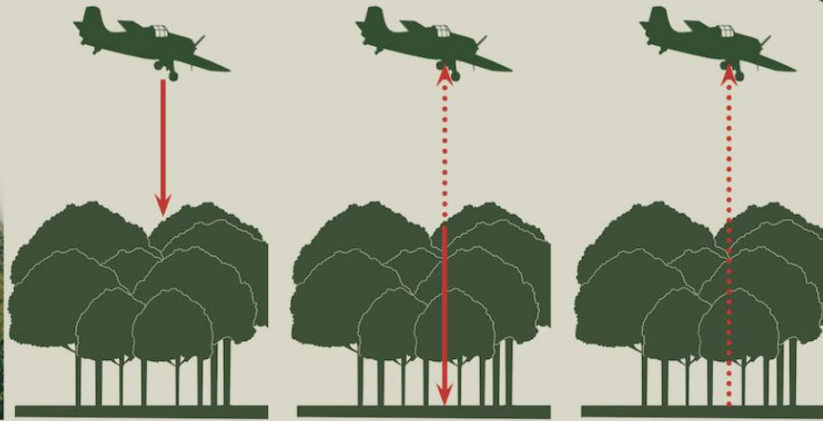
Global Positional System (GPS) ground reference and satellites—detect aircraft position

Inertial Measurement Unit system (IMU)—determines aircraft’s orientation



Lasers sweep across the terrain measuring the range and scan angle to ground.

A camera sees only the nearest objects, not what’s underneath the canopy.



## LIDAR IN ACTION

Vegetation limits aerial photography. It does not limit LiDAR. Where light can go, LiDAR can go. LiDAR pulses reflect from multiple points, starting at the first item they hit, and continue to the ground. So LiDAR can provide information about things that people cannot see.

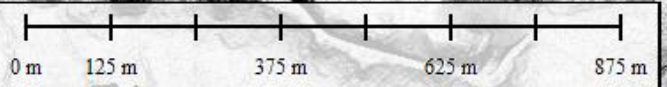
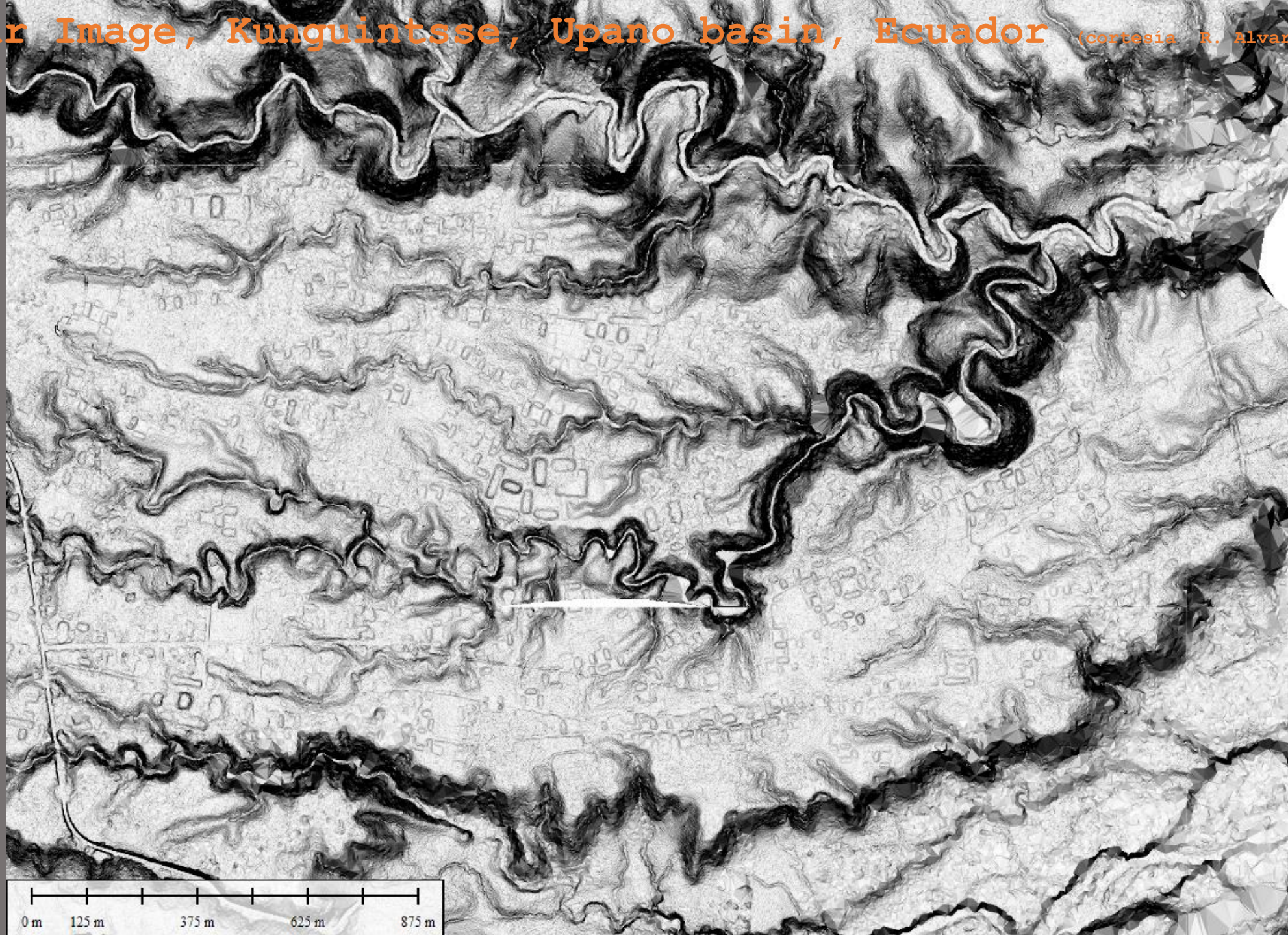


# Lidar Image, Kunguintsse, Upano basin, Ecuador (cortesia R. Alvarez Ol.Wohlfson)



# Lidar Image, Kunguintsse, Upano basin, Ecuador

(cortesia R. Alvarez y Ol.Wohlfson)

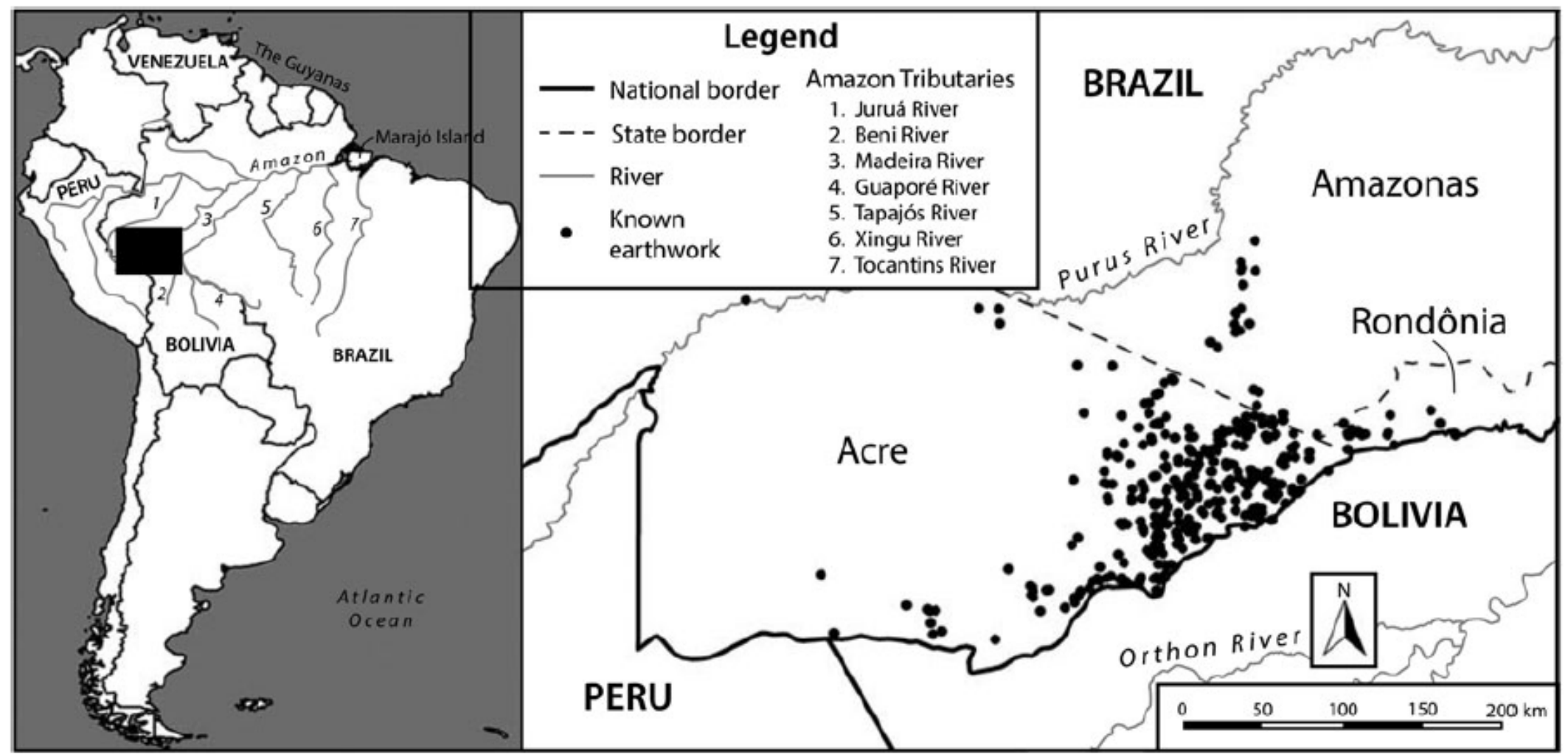




**GEOGLIFO QUADRADO COM VALAS E ESTRADAS**

## Diversity of Pre-colonial Earthworks in the Brazilian State of Acre, Southwestern Amazonia

Sanna Saunaluoma<sup>a</sup>, Martti Pärssinen<sup>b</sup>, and Denise Schaan<sup>c</sup>



**Figure 1.** Locations of the registered earthwork sites in Brazilian states of Acre, Amazonas, and Rondônia.

CASE STUDY

## Geometry by Design: Contribution of Lidar to the Understanding of Settlement Patterns of the Mound Villages in SW Amazonia

Jose Iriarte<sup>\*</sup>, Mark Robinson<sup>\*</sup>, Jonas de Souza<sup>†</sup>, Antonia Damasceno<sup>‡</sup>, Franciele da Silva<sup>\*</sup>, Francisco Nakahara<sup>§</sup>, Alceu Ranzil<sup>||</sup> and Luiz Aragao<sup>¶</sup>

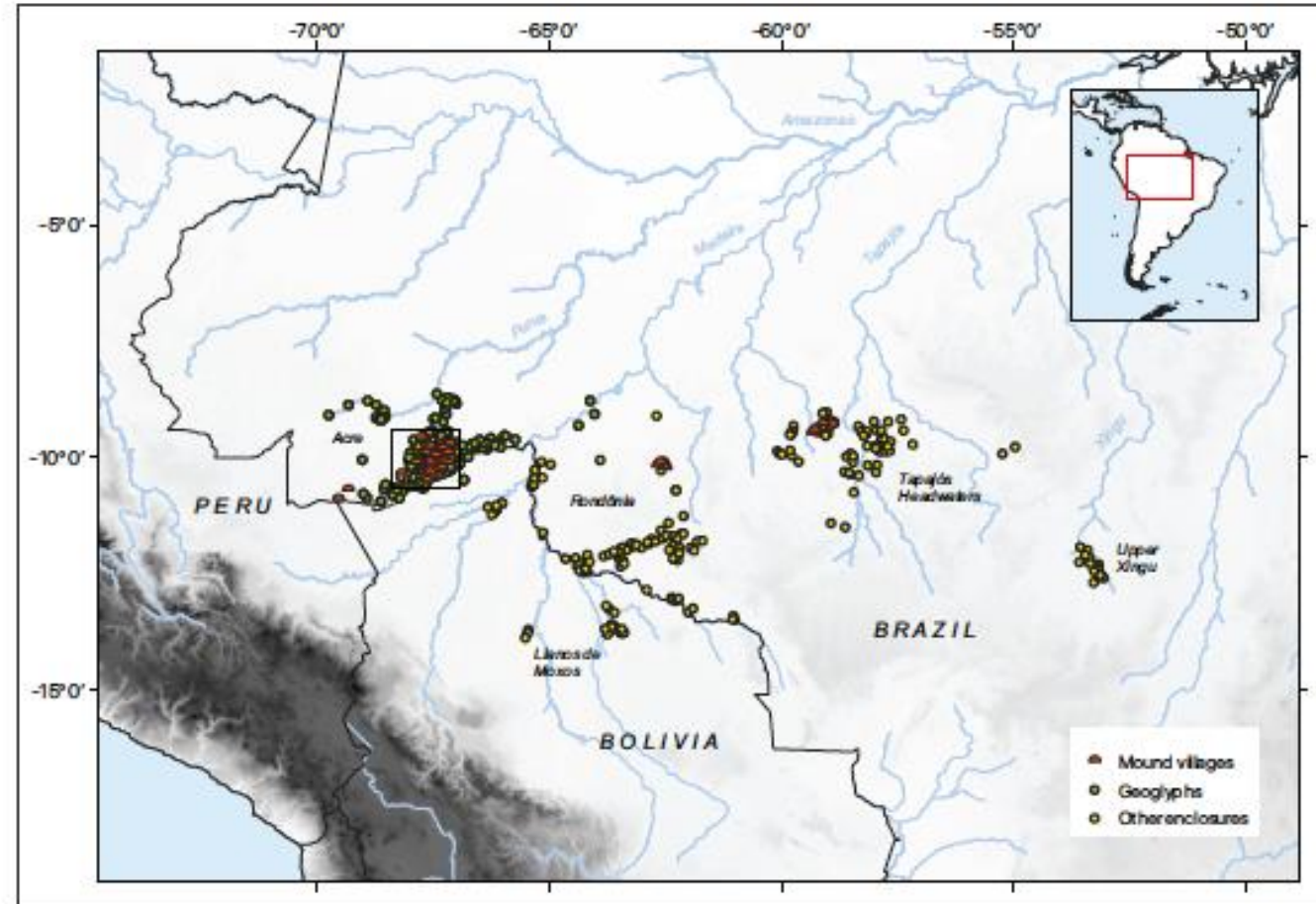


Figure 1: Map of earthworks across the southern rim of the Amazon showing spatial dispersion of mound villages. For the inset in the state of Acre, see Figure 2.

ANTHROPOLOGY

# More than 10,000 pre-Columbian earthworks are still hidden throughout Amazonia

Vinicius Peripato *et al.*

Indigenous societies are known to have occupied the Amazon basin for more than 12,000 years, but the scale of their influence on Amazonian forests remains uncertain. We report the discovery, using LIDAR (light detection and ranging) information from across the basin, of 24 previously undetected pre-Columbian earthworks beneath the forest canopy. Modeled distribution and abundance of large-scale archaeological sites across Amazonia suggest that between 10,272 and 23,648 sites remain to be discovered and that most will be found in the southwest. We also identified 53 domesticated tree species significantly associated with earthwork occurrence probability, likely suggesting past management practices. Closed-canopy forests across Amazonia are likely to contain thousands of undiscovered archaeological sites around which pre-Columbian societies actively modified forests, a discovery that opens opportunities for better understanding the magnitude of ancient human influence on Amazonia and its current state.

# SOL DE CAMPINAS SITE

(foto Deyvesson Gusmão)



# SOL DE CAMPINAS – ESCAVAÇÃO MONTÍCULO 11





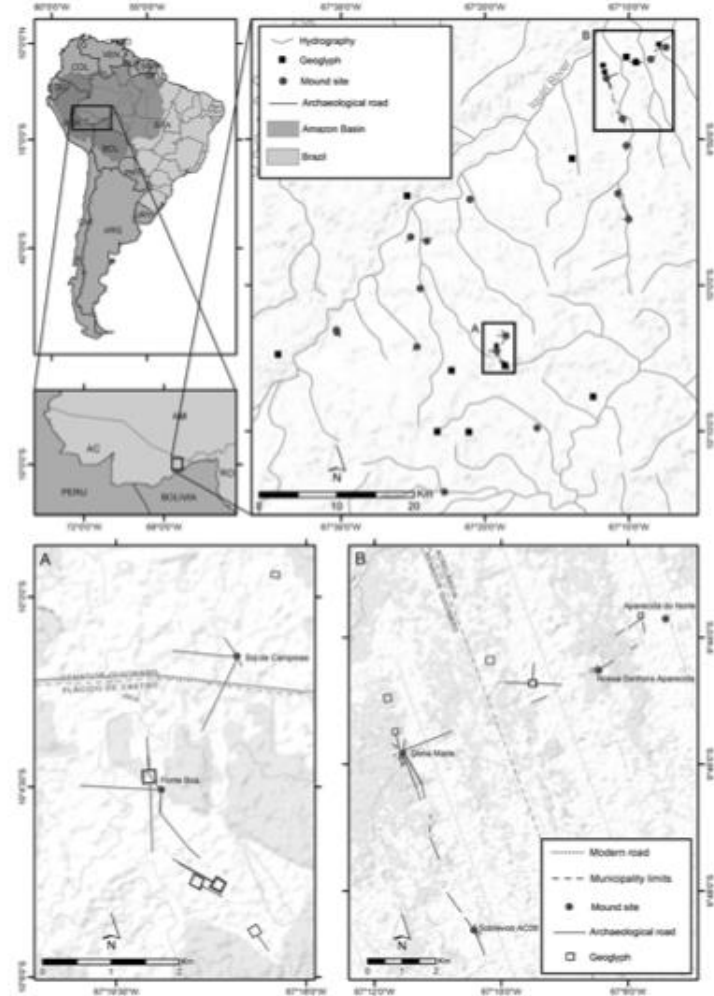


Fig. 6 - B/W online, B/W in print

Figure 6. Roads associated with (a) Fonte Boa and Sol de Campinas, and (b) Sobrevoo AC09, Dona Maria, Nossa Senhora Aparecida, and Aparecida do Norte.

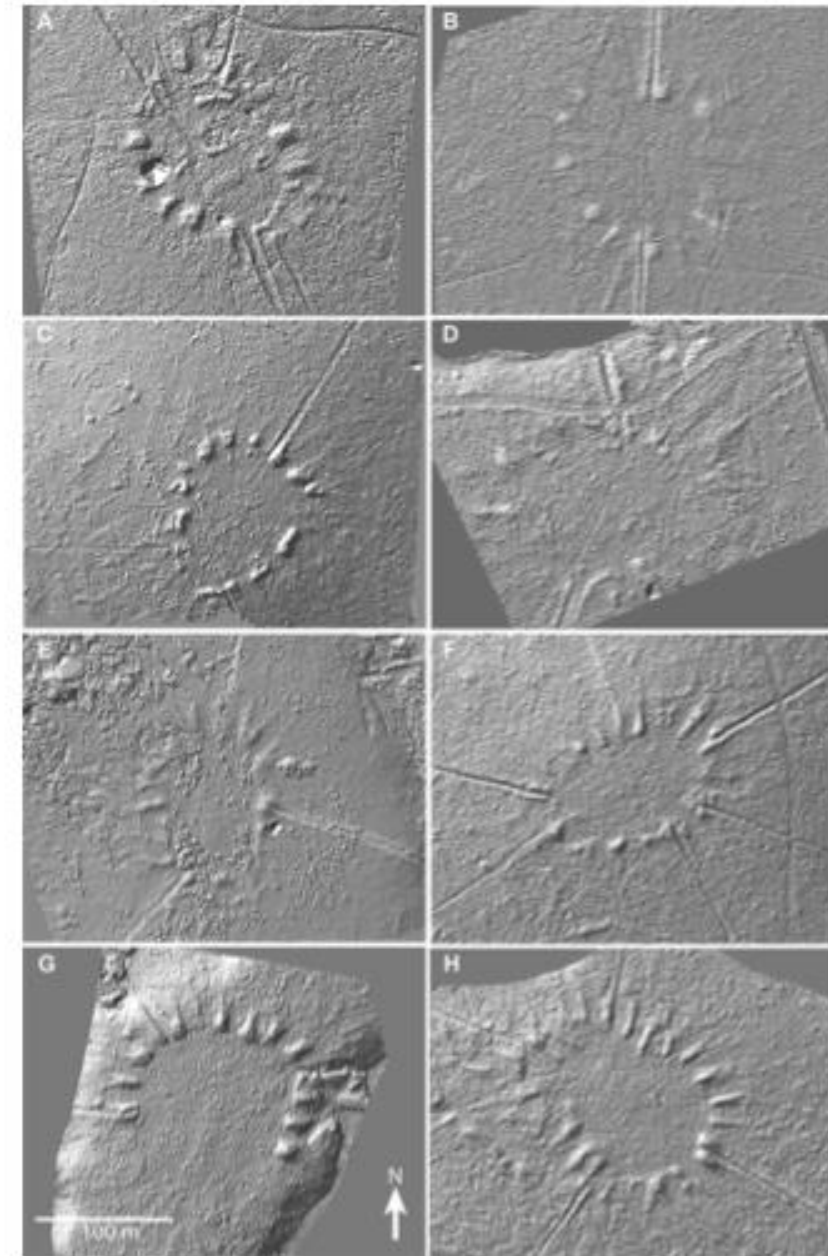


Fig. 3 - B/W online, B/W in print

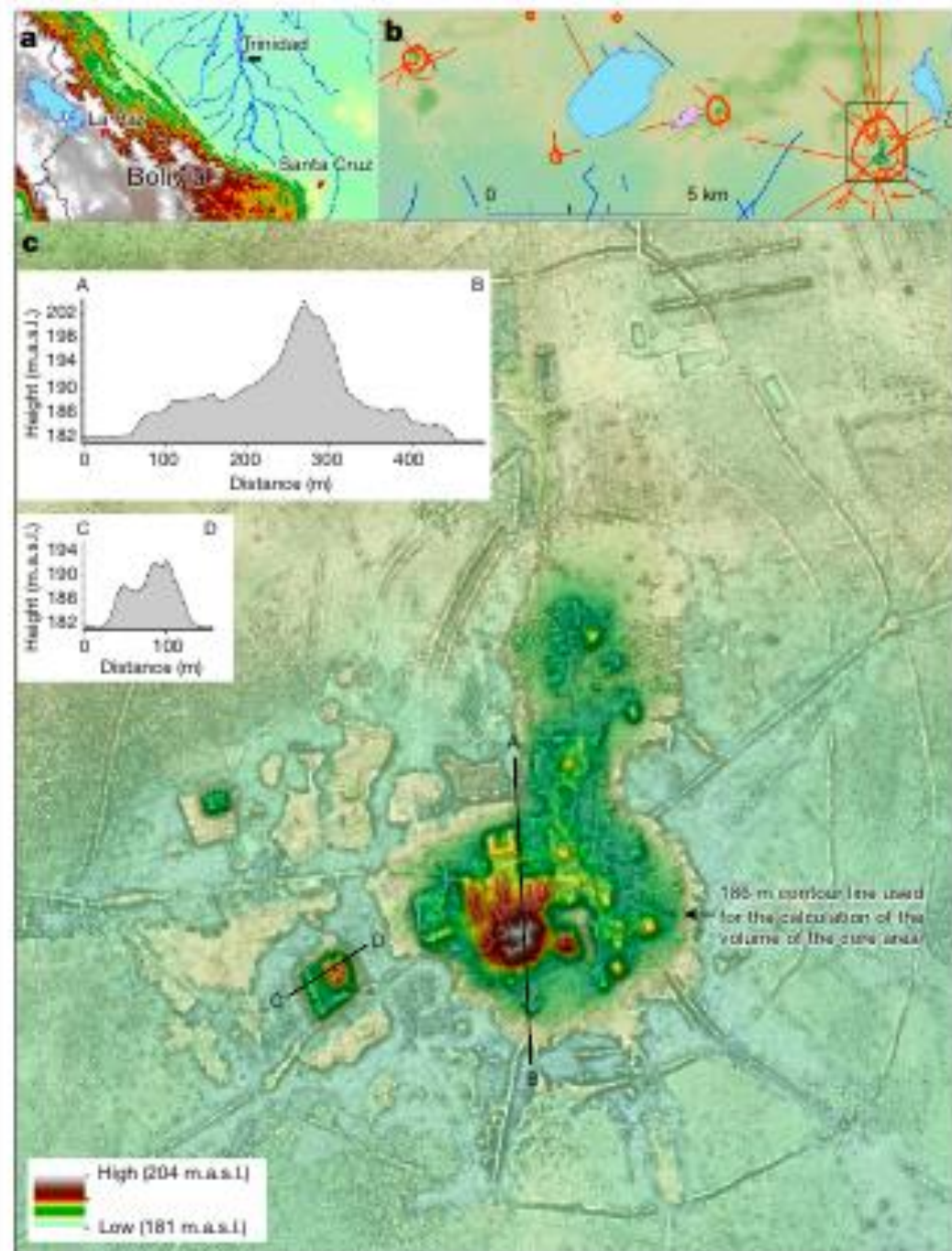
Figure 3. Hillshaded elevation models of the UAV-surveyed plaza village sites. (a) Sobrevoo AC09; (b) Boa Esperança; (c) Novo 2; (d) Novo I; (e) Fazenda Indaia; (f) Sol do Iquiri; (g) Sol de Campinas; and (h) Montículos Plácido. All sites are oriented to the north and on the same scale.

# Linear road in Acre, courtesy Rob Walker



# Lidar reveals pre-Hispanic low-density urbanism in the Bolivian Amazon

<https://doi.org/10.1038/s41586-022-04780-4> Heiko Prümers<sup>1,2</sup>, Carla Jaimes Betancourt<sup>2</sup>, José Iriarte<sup>3</sup>, Mark Robinson<sup>3</sup> & Martin Schaich<sup>4</sup>



**Fig. 2 | The Cotoca site (no. 185). a, Occupation of the Cotoca lidar area. b, Sites**

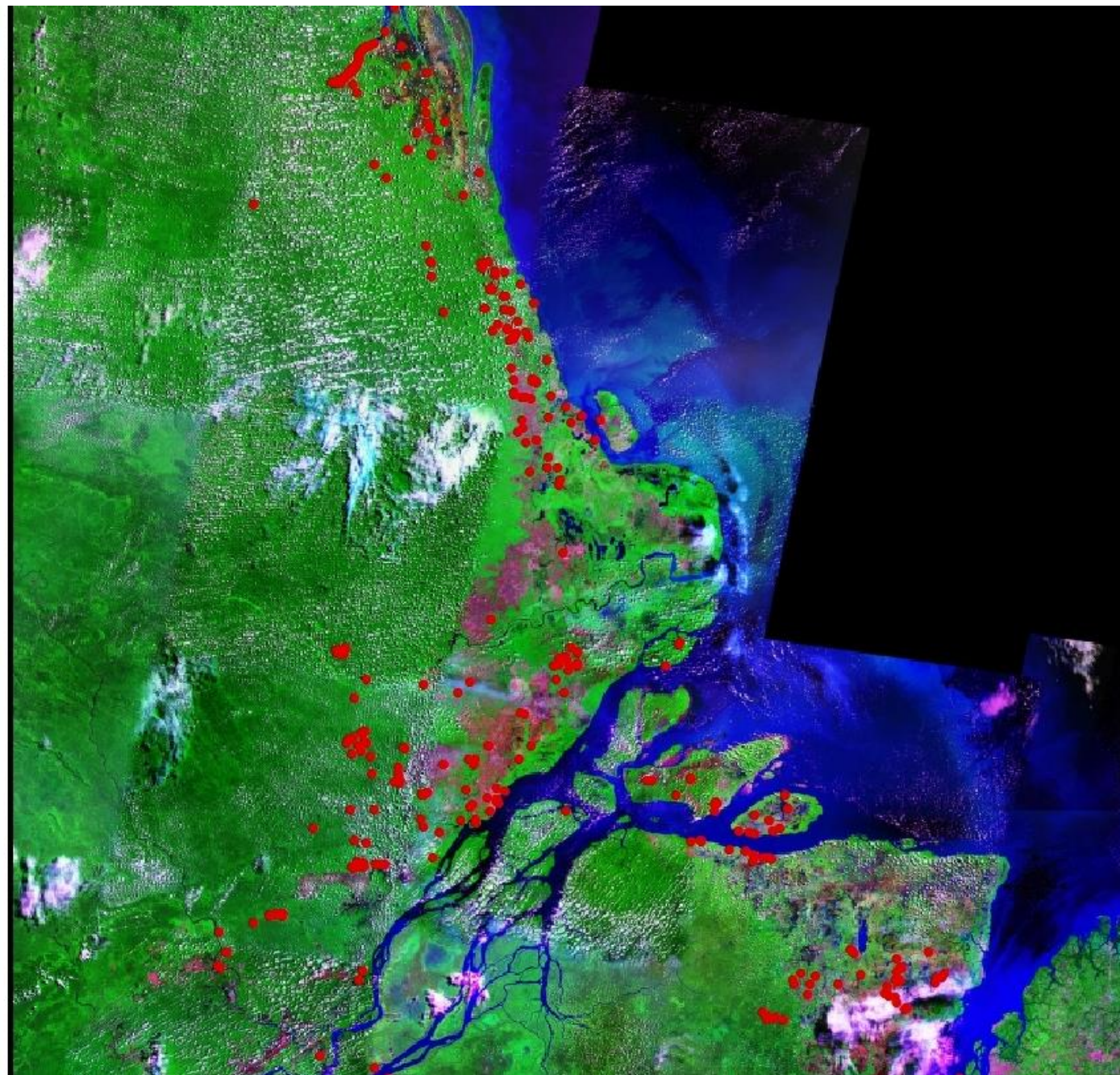
# LA PUNTA, BENI, BOLIVIA

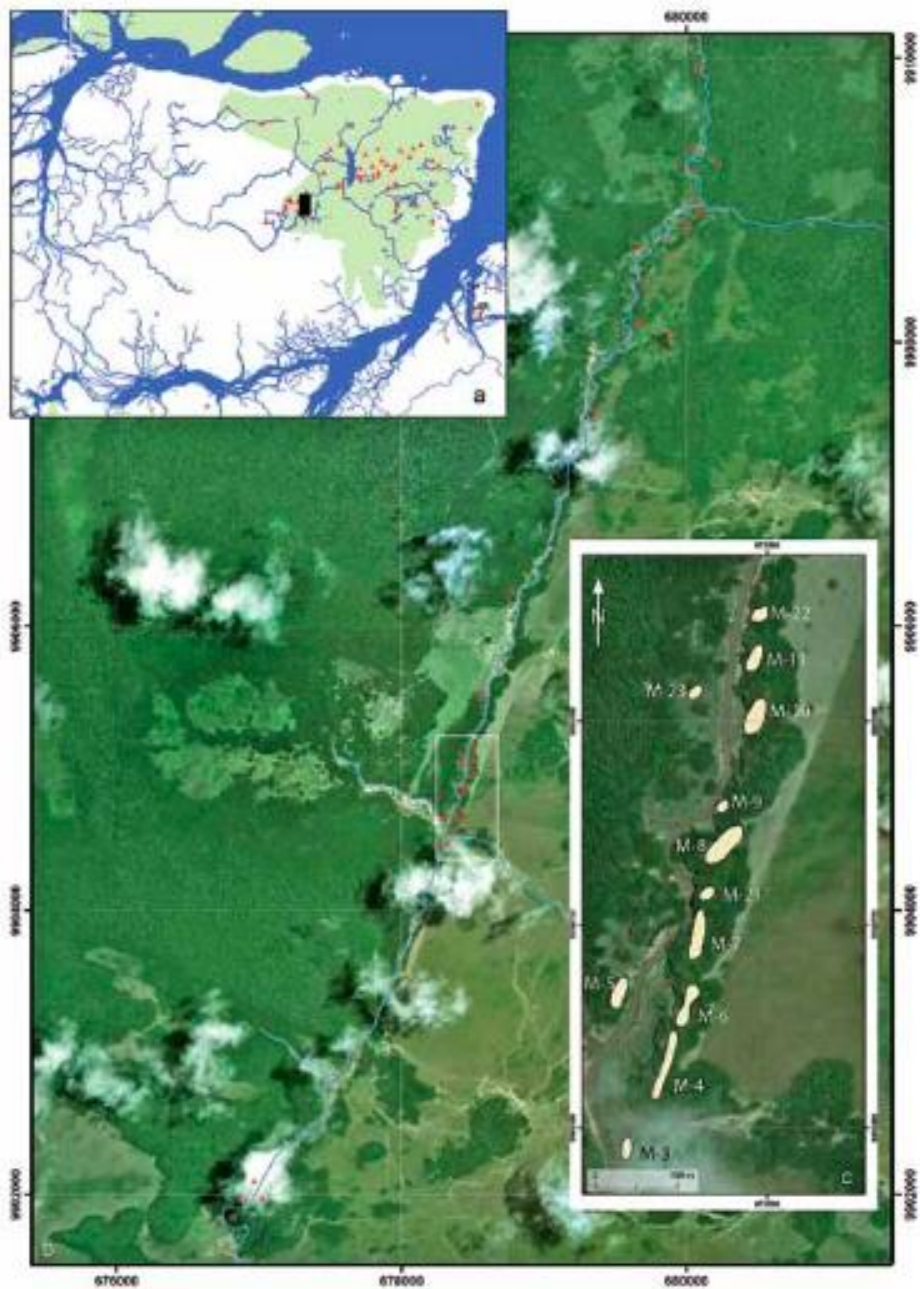
(PHOTO G. NEVES)





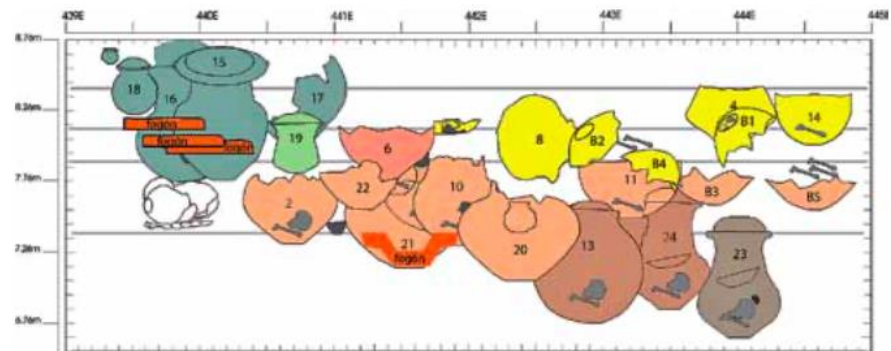
# SÍTIOS ARQUEOLÓGICOS NA FOZ DO AMAZONAS (Cabral & Saldanha 2012)





**Earthworks of the Amazon, Fig. 1** Teso dos Bichos mound, Marajó Island, Brazil. (Photography: © Wagner Souza e Silva. © Antiga Amazônia Presente ([amazoniantiga.tv.br](http://amazoniantiga.tv.br)))

58 LAS SIETE MARAVILLAS DE LA AMAZONÍA PRECOLOMBINA



**Figura 6.** Dibujo sumario de los entierros en urna encontrados en el montículo 17 de Camutins. Los colores indican diferentes episodios sucesivos en el uso de este área del sitio (modificado según Schaaf 2004: Figs. 65-68)

# URNAS MARAJOARAS, BIENAL DO MERCOSUL, PORTO ALEGRE, 2003

(FOTO E. NEVES)



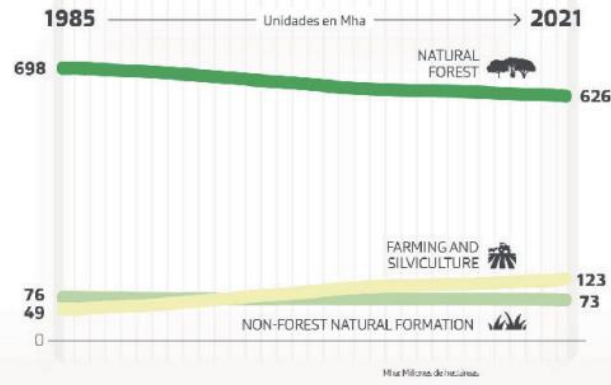


# The Amazon lost 9.7% of its natural vegetation in 37 years

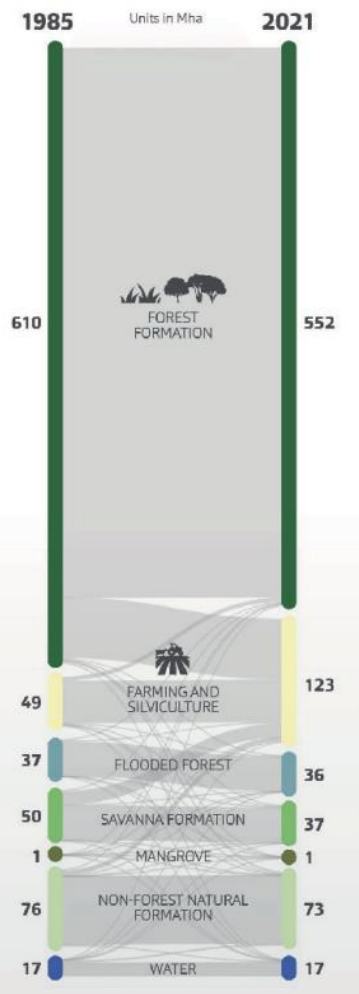
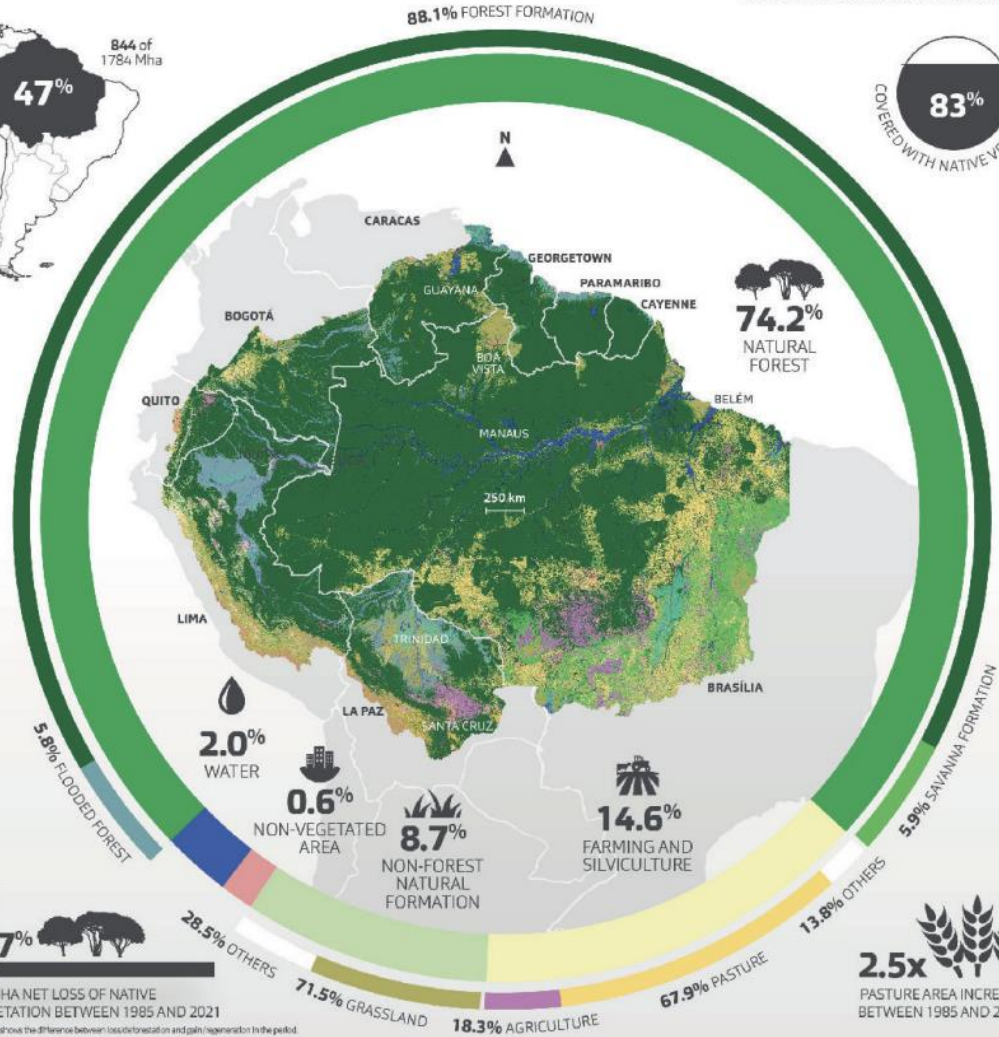
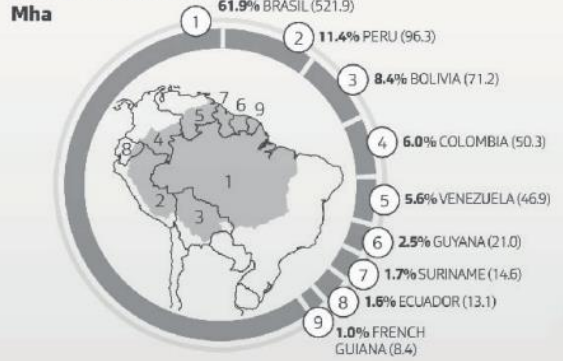
Para más información acceder a: [amazonia.mapbiomas.org](http://amazonia.mapbiomas.org)  MAPBIOMAS (AMAZONIA) 

## Amazon

Annual dynamic of land cover and land use (1985-2021)



### COUNTRIES



Fuente: Mapbiomas/Amazonia Corredor s.d. Elaboración: Mapbiomas/Amazonia Corredor s.d. con información de campo en visitas de campo y levantamiento por satélite (1985-2021).

- NATURAL FOREST
- FOREST FORMATION
- SAVANNA FORMATION
- MANGROVE
- FLOODED FOREST
- NON-FOREST NATURAL FORMATION
- WETLAND
- ROCKY OUTCROP
- GRASSLAND
- OTHER NON-FOREST NATURAL FORMATION
- FARMING AND SILVICULTURE
- PASTURE
- AGRICULTURE
- MOSAIC OF USES
- NON-VEGETATED AREA
- URBAN INFRASTRUCTURE
- MINING
- OTHER AREA WITHOUT VEGETATION
- WATER

Amazon river near Tefé (Lalo de Almeida)



Amazon river near Tefé (October 2023 – Lalo de Almeida)





- Early 2000s: deforestation, land conflicts and slave labour
- Invasions of indigenous peoples and traditional communities' territories

Timber lorries without number plates in Uruará. Photo: Maurício Torres





**Povos indígenas isolados  
Limite Biogeográfico da Amazônia**

- Povos Isolados na Amazônia Brasileira
- Povos Isolados pan amazônia

- Limites países
- Limites Pan amazônia

Coordenada Geográfica: SIRGAS 2000  
Datum: SIRGAS 2000  
Unidade: Graus  
Fonte de dados: Autores(2021), Funai(2019), IBGE(2019)  
Autor: Luis Felipe dos Santos Melo



# AMAZÔNIA REVELADA



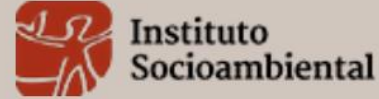
HOME | PROJETO | IMPRENSA | PESQUISADORES | PARCEIROS | CONTATO

EM PARCERIA COM **POVOS DA FLORESTA**, O PROJETO **SOBREVOARÁ A  
AMAZÔNIA COM A TECNOLOGIA LIDAR** PARA MAPEAR SÍTIOS ARQUEOLÓGICOS  
ENCOBERTOS PELA **VEGETAÇÃO**.

Financiadora

**National  
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Apoio



**COORDINATION TEAM – 5 PEOPLE**

**COORDINATION FOR SURVEY AREAS AND LOCAL COMMUNITIES – 4 PEOPLE**

**DEI TEAM – 3 PEOPLE**

**COMMUNICATIONS TEAM – 3 PEOPLE**

**DATA ACQUISITION – FOTOTERRA**

**DATA PROCESSING – INPE – 3 PEOPLE**

**ADMINISTRATION AND REGRANTING – INSTITUTO ARAPYAU**

**GIS PLATFORM – MAPBIOMAS**

**PROJECT HUB – MUSEU DA AMAZÔNIA – MUSA**



# AMAZON REVEALED

## THE AMAZON BIOME



- Land Cover
- Rainforest
  - Savanna, Mangrove, Wetland, Grassland
  - Deforestation until 2020
  - Hydrography

- LIDAR Plot Areas
- 1 - Lake Tefé
  - 2 - Eastern Acre / Southern Amazonas
  - 3 - Middle Guaporé
  - 4 - Upper Tapajós
  - 5 - Terra do Meio
  - 6 - Upper Xingu
  - 7 - Upper Rio Negro
  - 8 - Lower Trombetas
  - 9 - Amapá
  - 10 - Northern Tocantins



Pacific Ocean

Data Sources:  
MapBiomas Land Cover Collection 2.0  
PRODES (INPE) Accumulated Deforestation  
ESRI World Imagery Basemap  
DIVA-GIS

Bruno Barreto, 2021  
Datum: CGS WGS 1984



**MAPPING WORKSHOP WITH LOCAL COMMUNITY AT TERRA DO MEIO,  
APRIL 2022**





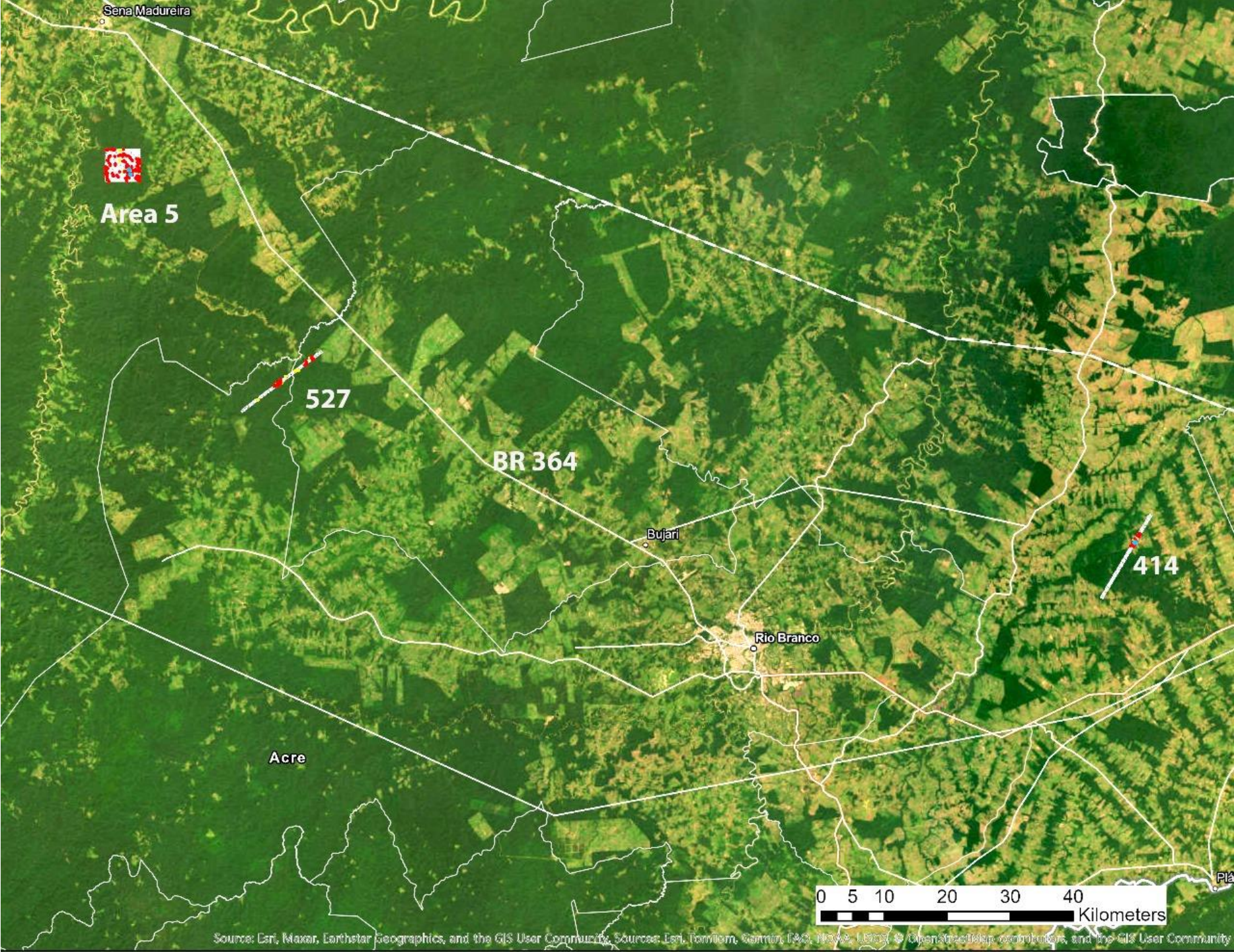
**FIELD MAPPING OF PLACE OF INTEREST WITH LOCAL  
COMMUNITARIANS, TERRA DO MEIO, APRIL 2022**

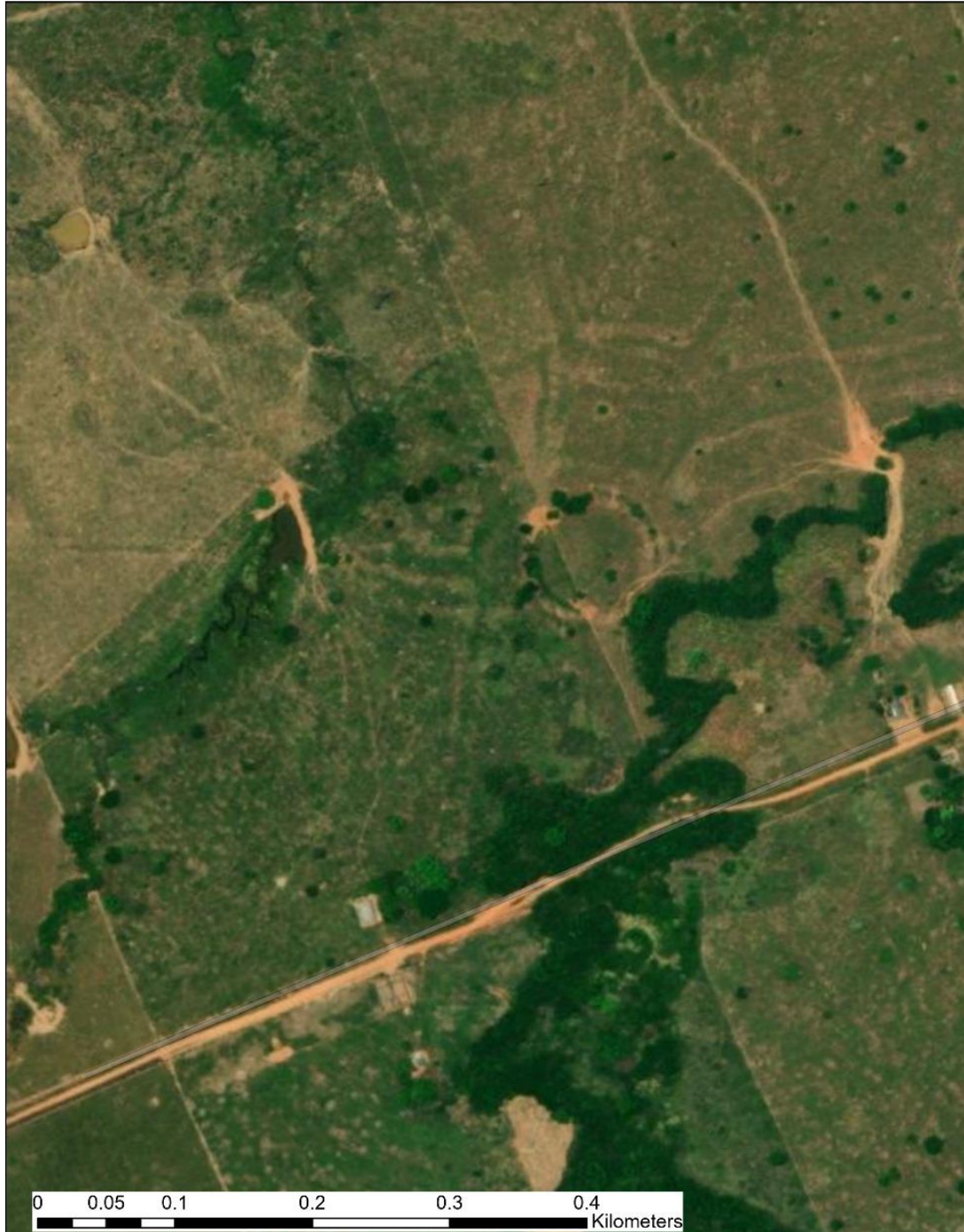
**SERRA DA MURALHA, RO, FOTO E. NEVES**





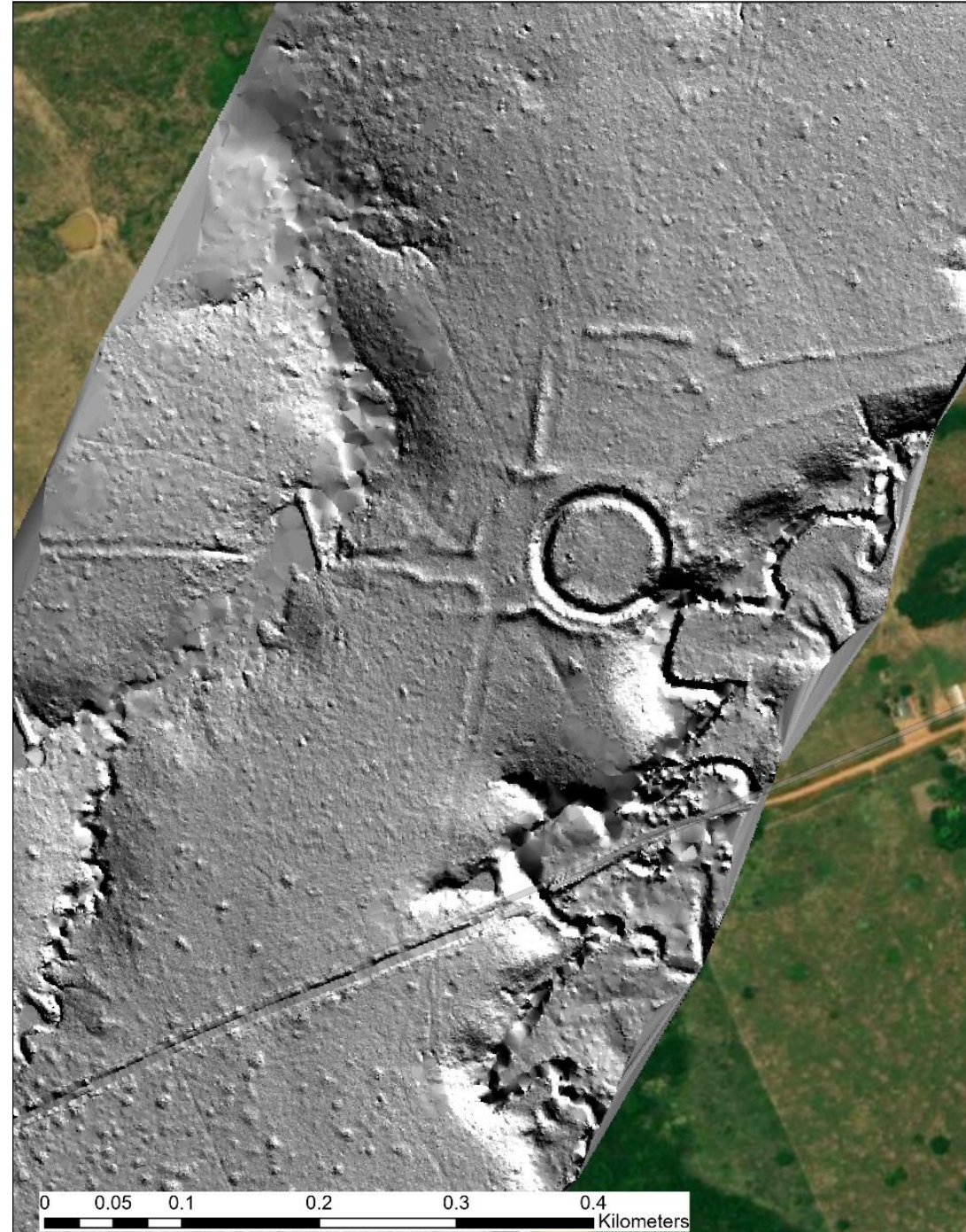
# AREA 5 ACRE





0 0.05 0.1 0.2 0.3 0.4  
Kilometers

Source: Carl Mazer, Earthstar Geographics, and the GIS User Community. Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community



0 0.05 0.1 0.2 0.3 0.4  
Kilometers

Source: Carl Mazer, Earthstar Geographics, and the GIS User Community. Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community





Amazonas  
Area 1  
Sites 3-5  
Hillshade

