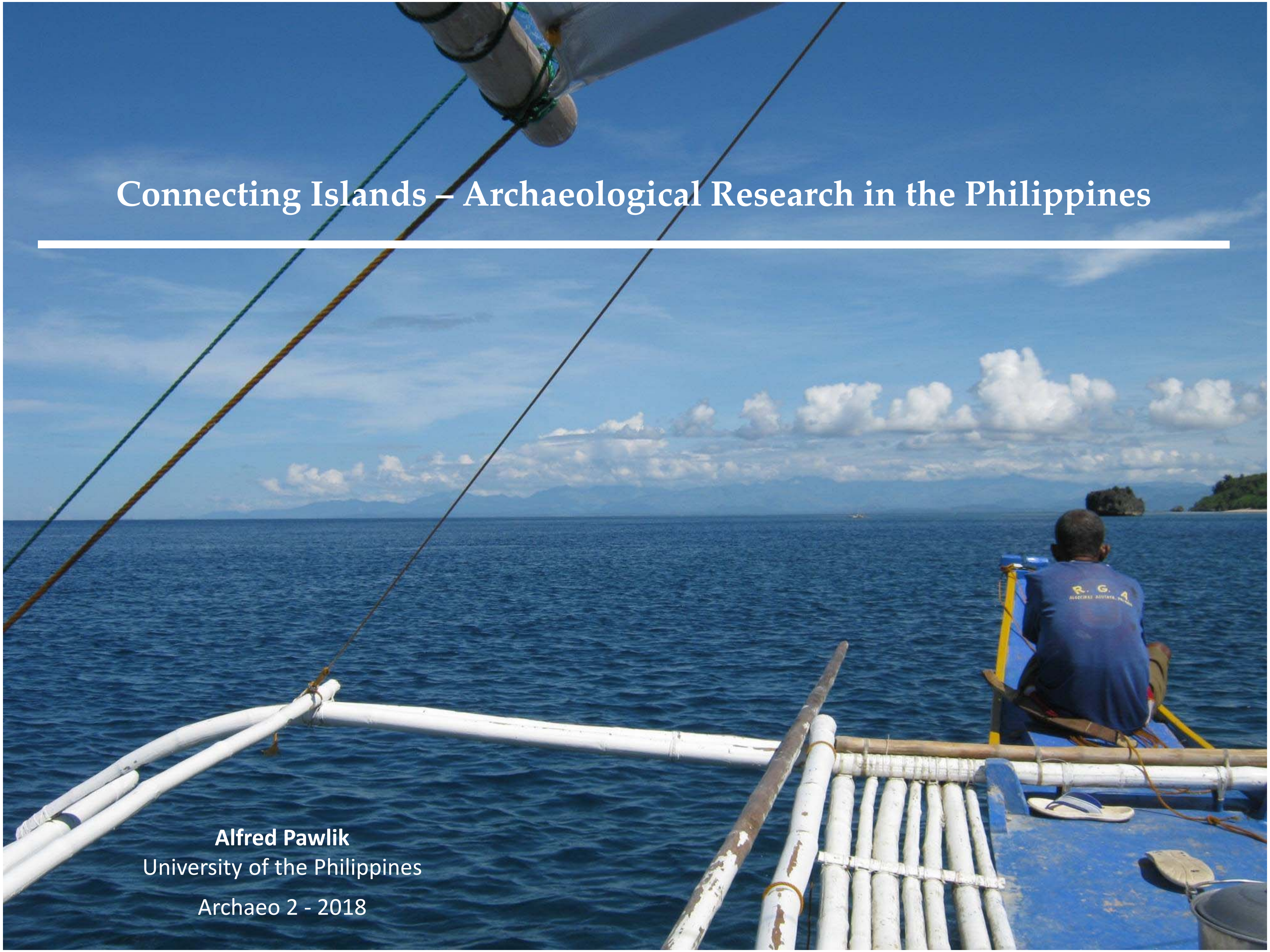


Connecting Islands – Archaeological Research in the Philippines

Alfred Pawlik
University of the Philippines

Archaeo 2 - 2018

Palaeo-Biogeography of the Philippine Archipelago

The Philippine archipelago straddles two distinct biogeographic zones, Sundaland and Wallacea.

The island of Palawan together with Coron and Busuanga is located west of Wallace/Huxley's Line and on the northeastern fringes of the Sunda Shelf. The fauna and flora are closely related to Island Southeast Asia.

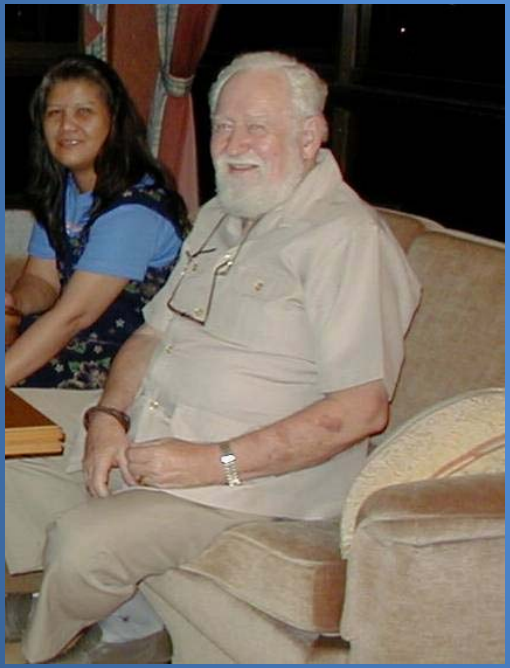
The main archipelago islands of Luzon, the Visayas and Mindanao, situated in Wallacea on the other hand, have never been physically linked to the mainland during the Pleistocene, and a sea crossing has always been needed to reach them.

These islands contain a remarkable endemic vertebrate fauna found nowhere else in the world.

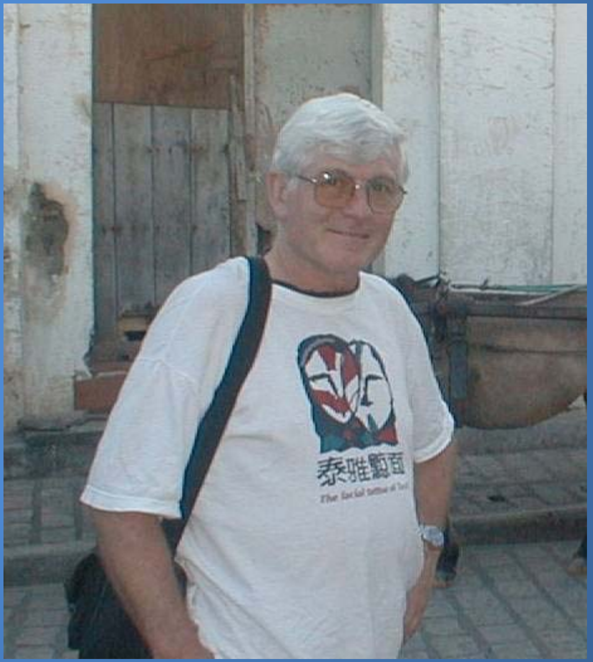
Philippine Archaeology: Neolithic

The Philippines are known for their geographical role in the Neolithization of island Southeast Asia and the peopling of the Pacific.

The Philippine archipelago is in the focus of two major migration theories, the “Nusantao Network” (Solheim) and “Out of Taiwan” (Bellwood).



Wilhelm G. Solheim II



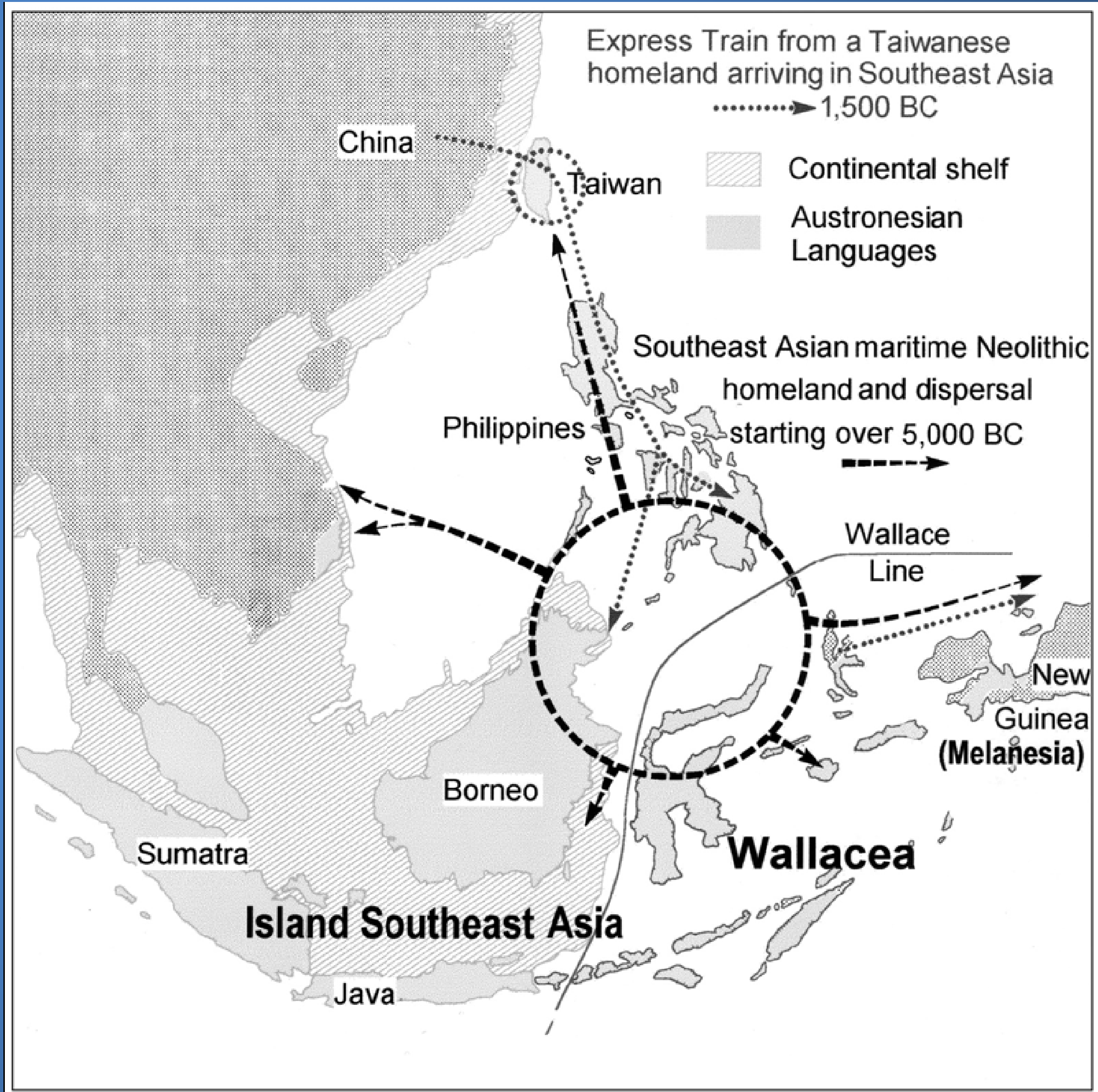
Peter Bellwood

Philippine Archaeology: Neolithic

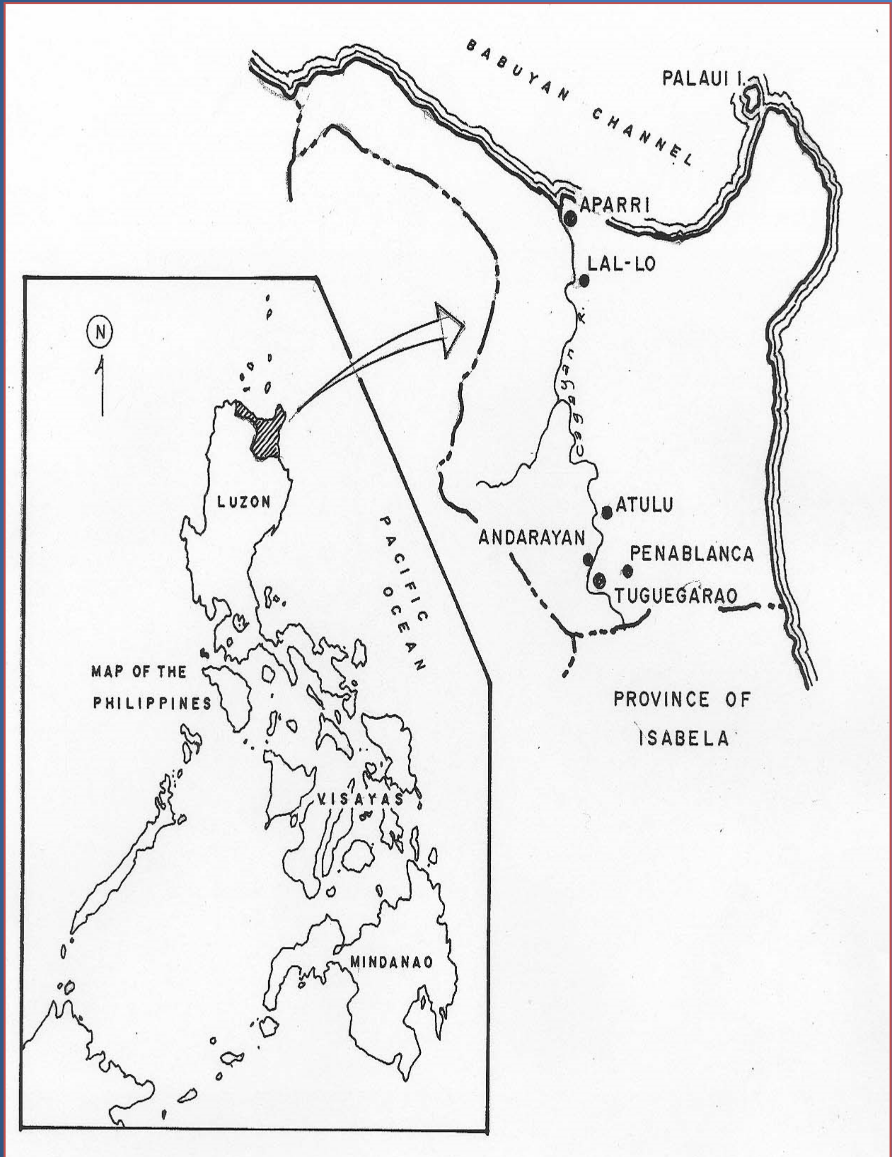
Two main alternative views of Polynesian origins, Asian mainland and offshore.

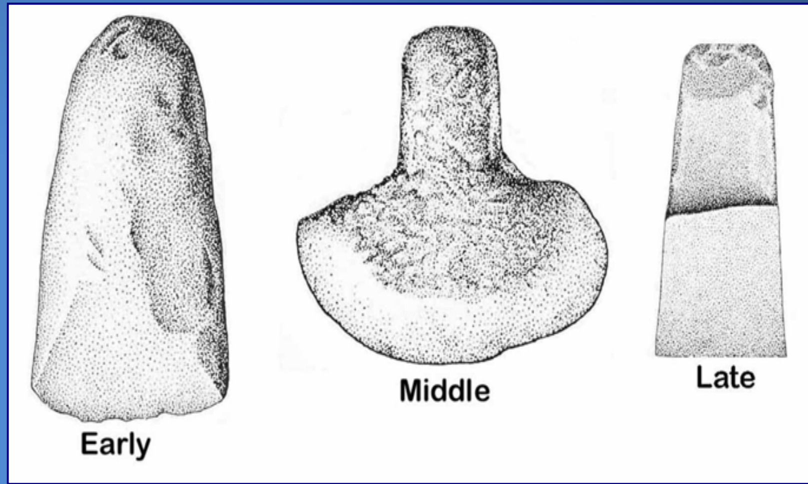
The **Nusantao Network** (interrupted black line and circle) argued for an Island Southeast Asian maritime Neolithic homeland as early as 7000 BP (Solheim 1996).

Out of Taiwan suggests a rapid migration from China via Taiwan, spreading over Island Southeast Asia and into Melanesia after 4000 BP ("Express Train from Taiwan to Polynesia"). It is shown as a dotted line (Bellwood 1997).



Philippine Archaeology: Neolithic

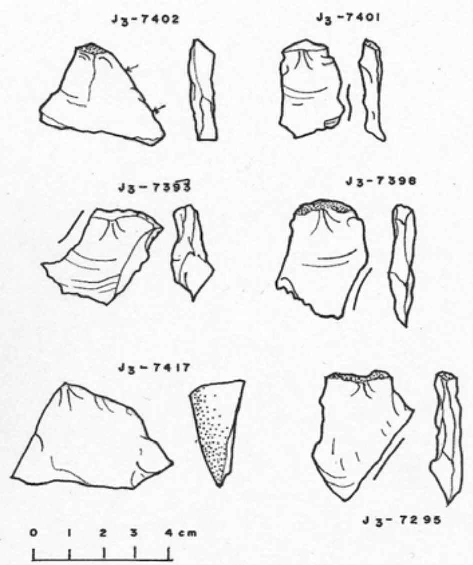




Ground stone adzes

Decorated pottery

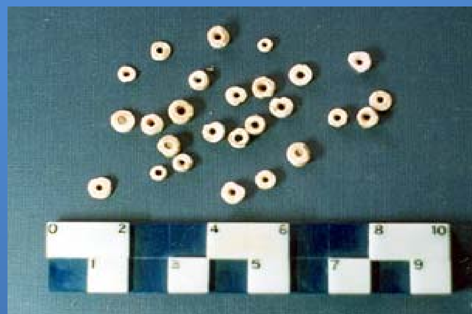
“Austronesian” Material Culture



“Unchanged” lithic material culture – unmodified flakes as stone tools

Red slipped, brown and black potteries

Clay *lingling o* earrings



Shell beads

Spindle whorls from Fengpitou, Taiwan (left) and Callao (right)

"Austronesian" Material Culture

Evidence for the migration from Southern Taiwan to Luzon by Austronesian speaking people (Bellwood 2005)
Pottery during the Middle Neolithic of Southern Taiwan (4000BP) similar to the Early Neolithic of northern Luzon (3800 BP; Mijares 2008).
Similarity of pottery styles provides a link between Taiwan and Luzon

Chaolaiqiao, S-Taiwan

Nagsabaran, N-Luzon

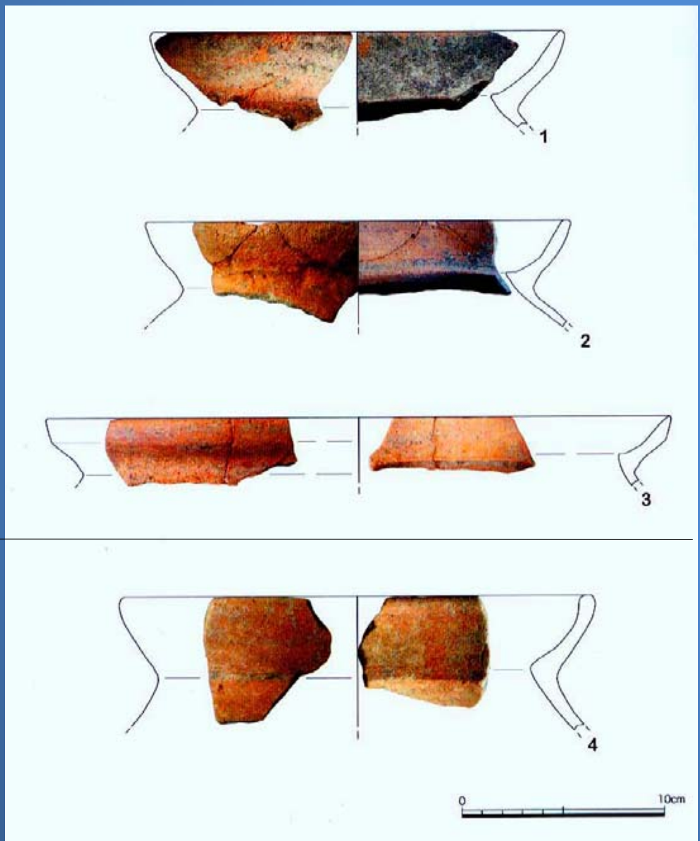


Fig. 4. Everted and internally concave rims from Chaolaiqiao, eastern Taiwan (1, 2, 3) and Nagsabaran, northern Luzon (4).

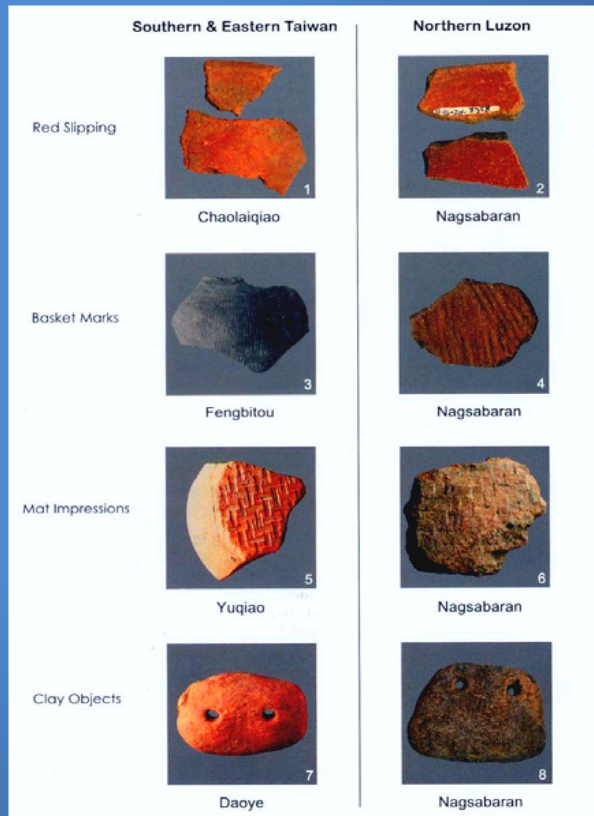
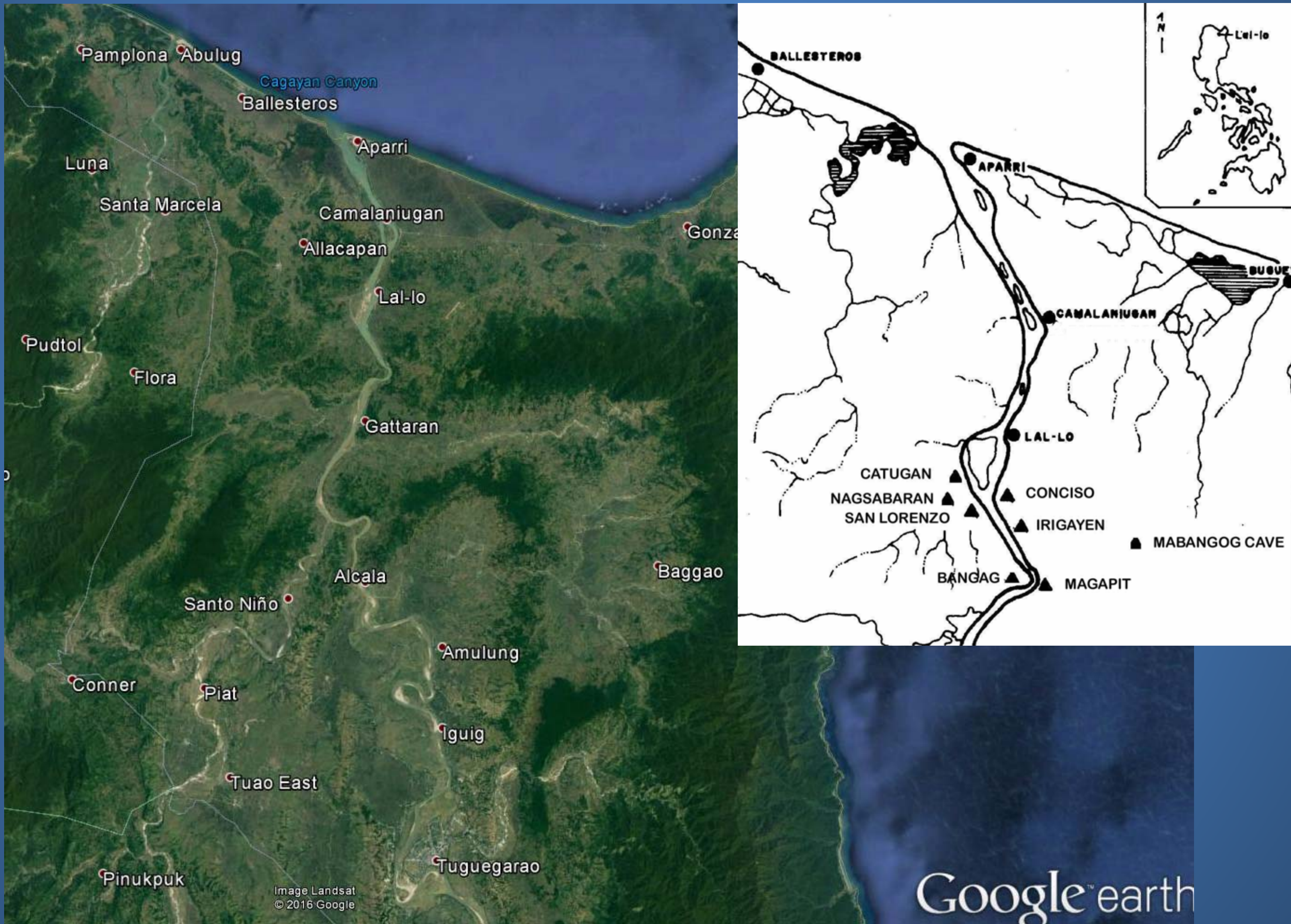
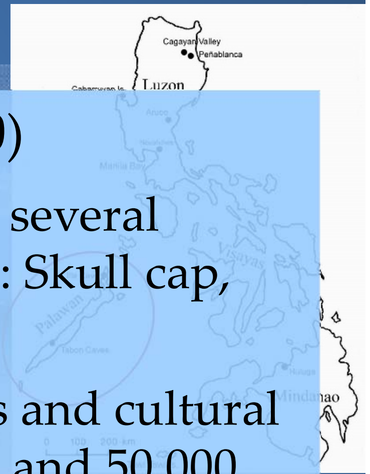


Fig. 6. Similar pottery decoration and clay objects from Taiwan and northern Luzon. (3. from Chang 1969: plate 59; 5. Liu 1990: plate 8.6; 7. Tsang *et al.* 2004: plate 5.51; 1, 2, 4, 6, 8. from National Museum of the Philippines and the author.)

“Austronesian” Sites in N-Luzon



Palawan Island: Entry point of Homo sapiens?



Tabon Caves (Fox 1970)

'Tabon Man': Remains of several individuals of ***H. sapiens***: Skull cap, mandible, femur bones.

Dates for human remains and cultural materials between 14,500 and 50,000 BP (^{14}C and U-series)

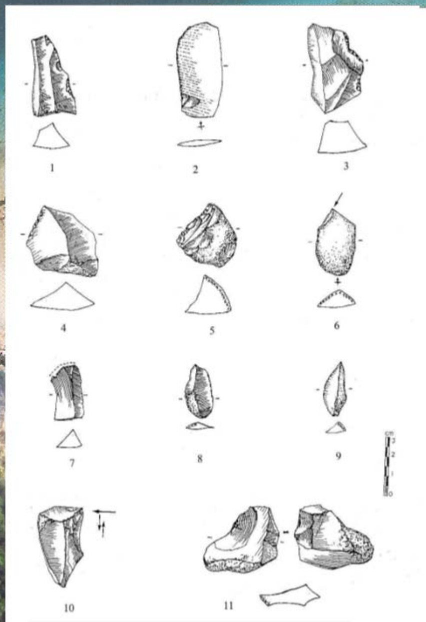


Fig.2 : Lithic assemblage from Tabon cave
1 to 9 : stone tools ; 10 and 11 : cores.
(H. Forestier drawings)

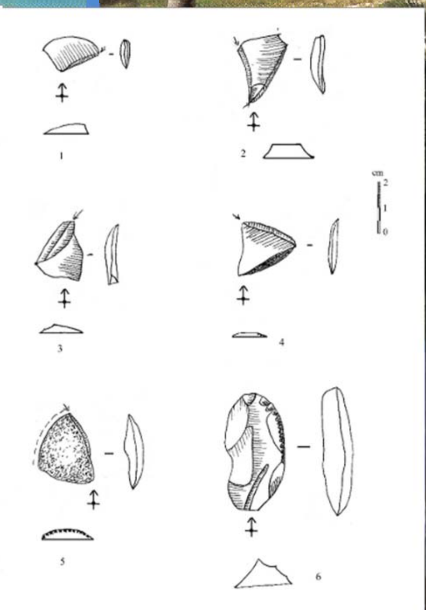
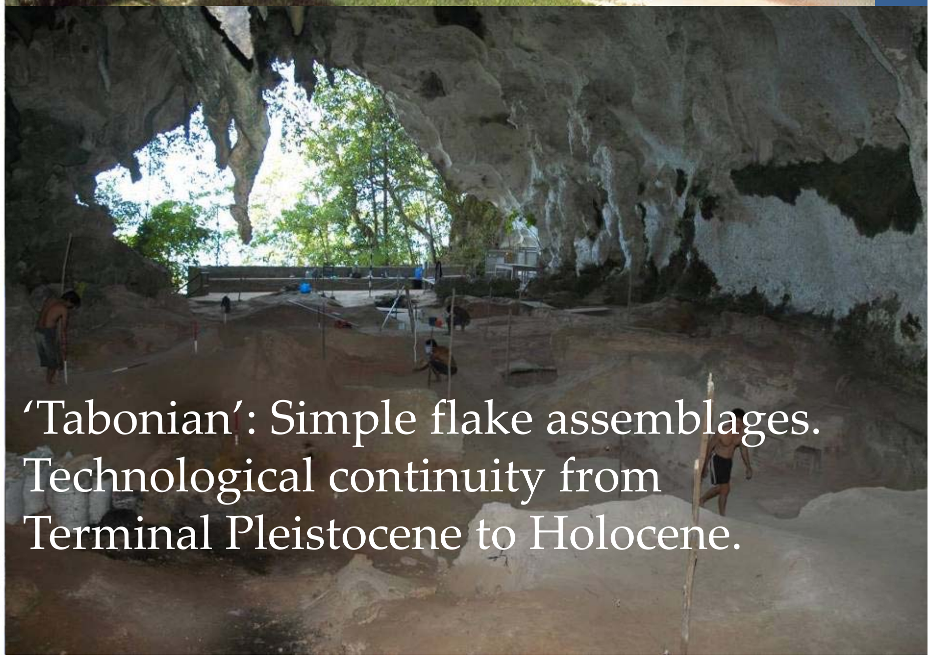
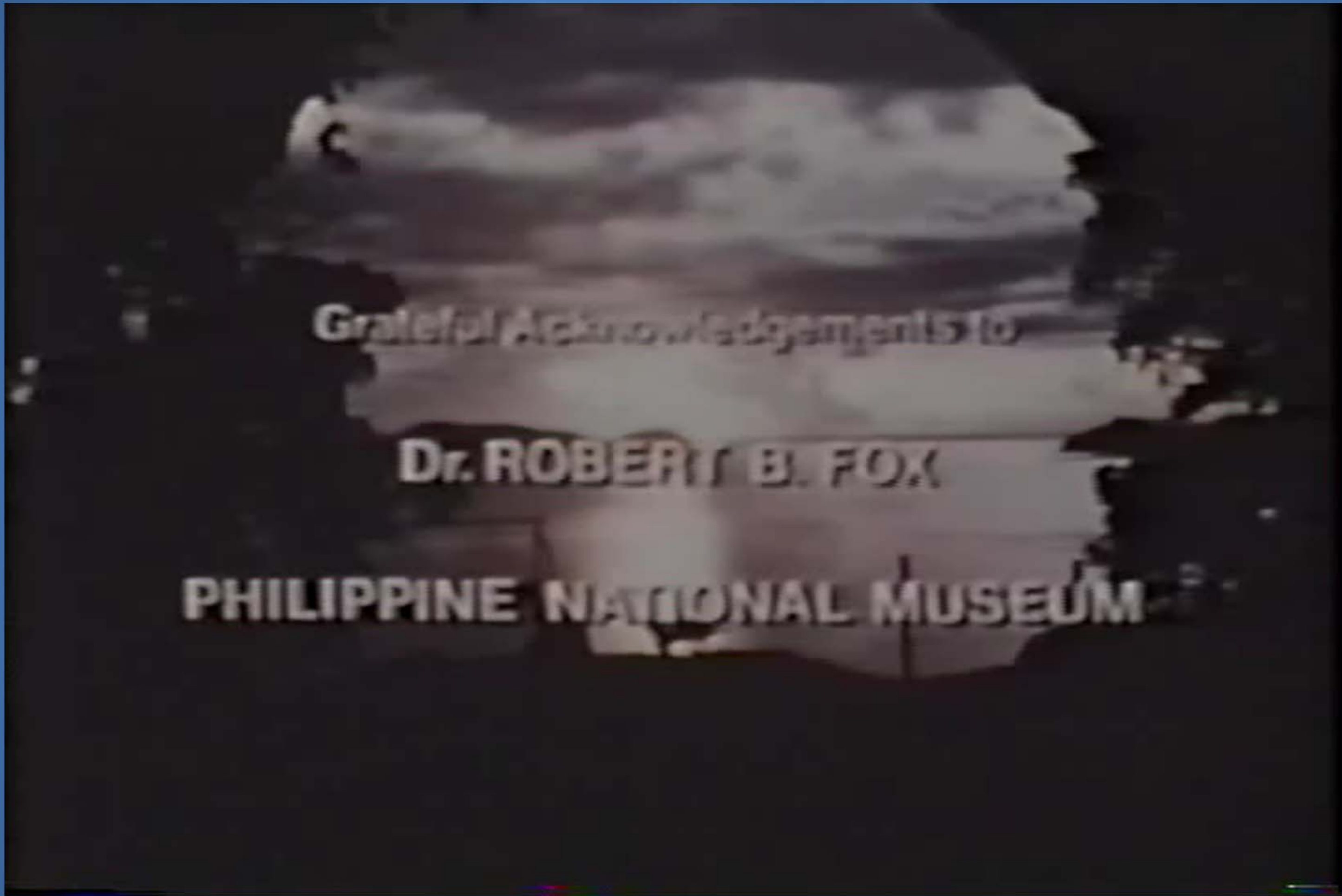


Planche 9 : Supports retouchés
1 : 62-I-sans n° E (burin); 2 : 62-I-sans n° F (burin dièdre);
3 : 62-I-sans n° (burin double); 4 : 62-I-sans n° (burin);
5 : 62-I-sans n° (outil composite); 6 : 62-I-sans n° B (racloir simple).



'Tabonian': Simple flake assemblages. Technological continuity from Terminal Pleistocene to Holocene.


Grateful Acknowledgements to
Dr. ROBERT B. FOX
PHILIPPINE NATIONAL MUSEUM

GEOCHRONOLOGICAL CONTEXT

International Commission on Stratigraphy (ICS-IUGS)

Quaternary epochs defined by *Global Boundary Stratotype Sections and Points* (GSSP)*

- Pleistocene 2.58ma – 11.7ka BP
- Lower/Middle Pleistocene boundary at 0.77ma BP
- Middle/Upper Pleistocene boundary at 126ka BP
- Pleistocene/Holocene Boundary defined by NGRIP2 core at 1492.45m depth (IUGS 2008)
  This boundary is connected to the sharp rise of $\delta^{18}O$ within 1-3 years from glacial to interglacial values. Indicates a rapid temperature increase at the end of the Younger Dryas at 11.7ka BP

*Gibbard et al. and the Subcommission on Quaternary Stratigraphy. **2010**. Formal ratification of the Quaternary System/Period and the Pleistocene Series/Epoch with a base at 2.58 Ma. Journal of Quaternary Science 25: 96–102.

GEOCHRONOLOGICAL CONTEXT

Holocene usually subdivided by regional climate stages

Two *Global Boundary Stratotype Section and Points**:

1. Early/Mid Holocene boundary at 8200 BP (8.2 Event)

2. Mid/Late Holocene boundary at 4200 BP (4.2 Event)

Time (cal BP)	Europe/N-America
11700	Younger Dryas ends
11700 – 10600	Preboreal
10600 – 9200	Boreal
9200 – 5650	Atlantic
5650 - 2400	Subboreal
2400 -present	Subatlantic

*Walker et al. 2012. Formal subdivision of the Holocene Series/Epoch. Journal of Quaternary Science 27: 649–659

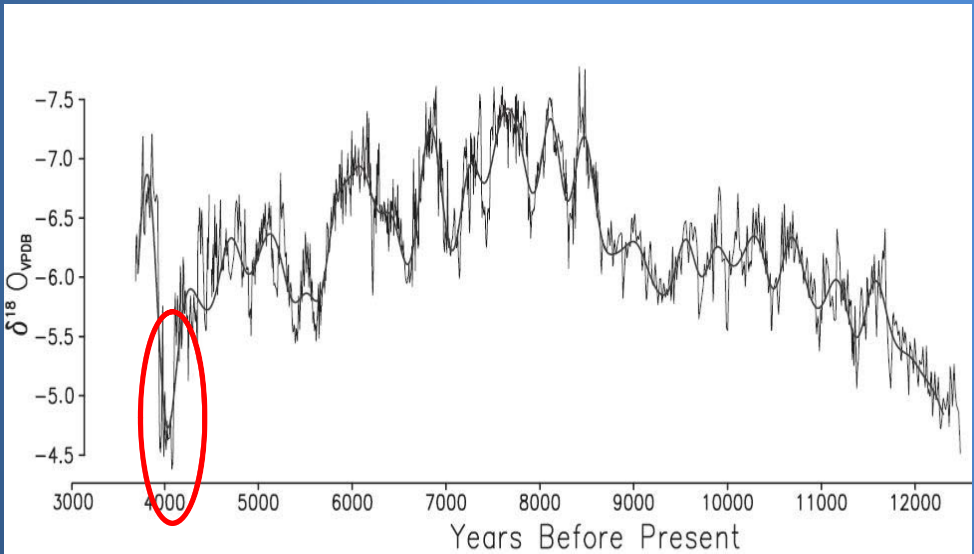
Palaeo-Climate

THE 4.2ka EVENT

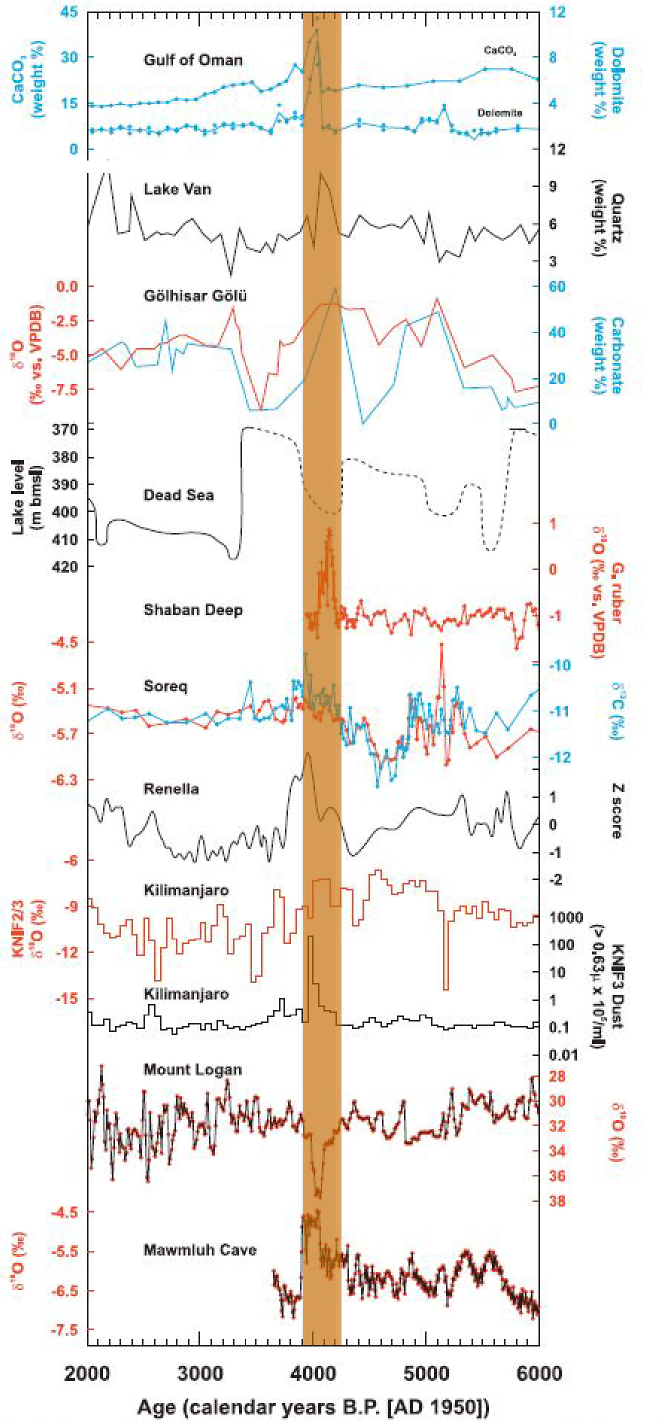
Selected published proxy records:

Orange bar marks the likely onset and termination of the 4.2 anomaly

Indicates a sharp drop in temperature (and a sharp rise after its end)



The Mawmluh Cave d[18]O record, showing the GSSP of the 4.2 event as clear isotopic signal (NE-India; Berkelhammer et al., 2012)



Palaeo Climate changes

THE 4.2 ka EVENT and its climatic effects:

- Marine and terrestrial proxy indicators in Australasia and S-America suggest a major climatic transition after 5.0 ka BP (McGlone et al., 1992)
- Marked cooling of southern ocean waters at c. 4.3 ka BP (Moros et al., 2009)
- Widespread and severe drought conditions are evident around 4.2 ka BP in pollen, diatom and testate amoebae assemblages, cave speleothem stable isotopes and dune systems (Weiss 2012)
- Pollen evidence from the tropical northeast Australia suggests the onset of an ENSO*-dominated climatic régime at c. 4.0 ka BP (Schulmeister & Lees, 1995)
- Onset of much colder conditions at c. 4.0 ka BP (Mischke & Zhang, 2010)
- In China, the 4.2 event is also marked by drought and, paradoxically, by extreme flooding (Huang et al., 2011)
- In Taiwan, an increase in palaeoprecipitation, reflecting a strengthening of the East Asia summer monsoon, happened about 4.2 ka BP (Yang et al., 2011).

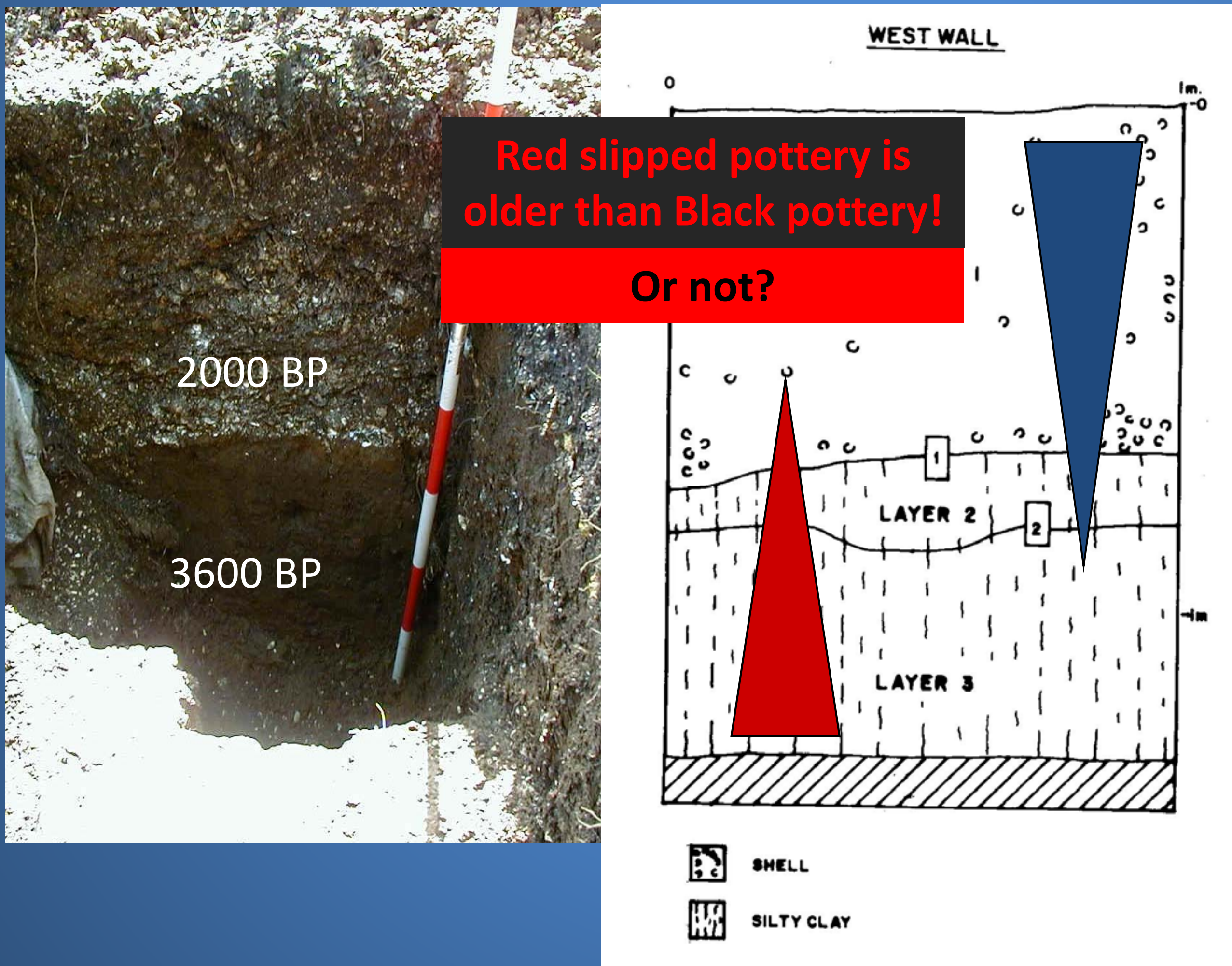
*El Niño–Southern Oscillations

Absolute Neolithic Chronology in N-Luzon (Carbon-14)

Site	Context (source)	Lab No.	Calibrated Date
Andarayan	14C date on rice husk in a red-slipped sherd (Snow *et al.* 1986)	unknown	4000-3350 BP
Conciso	Upper shell layer, On animal bone (Ogawa 2002), black pottery.	OOHM19	1190-1060 BP
Conciso	Lower shell layer ,On animal bone (Ogawa 2002), black pottery	OOHM16	2160-2000 BP
Bangag I	AMS date on organic material sealed in black pottery (Mihara *et al.* 2004)	NUTA2-5367	2310-2060 BP
Bangag I	AMS date on organic material sealed in black pottery (Mihara *et al.* 2004)	NUTA2-5368	2360-2300 BP
Irigayen	Shell layer, Charcoal (Ogawa 2002), black pottery	O-W8700	1520-1300 BP
Irigayen	Silty clay layer, Charcoal (Ogawa 2002), red-slipped and black pottery	NUTA2-914	3470-3340 BP
Irigayen	Silty clay layer, Charcoal (Ogawa 2002), red-slipped and black pottery	NUTA2-913	3470-3340 BP
Nagsabaran	Upper shell layer, Charcoal (Tsang *et al.* 2001), black pottery	GX-26797	1520-1280 BP
Nagsabaran	Lower shell layer, Charcoal (Tsang *et al.* 2001), black pottery	GX-26806	2500-1700 BP
Nagsabaran	Silty clay layer, charcoal (Tsang *et al* 2001), red-slipped and black pottery	GX-38379	3400-3000 BP
Nagsabaran	Silty clay layer, Charcoal (Tsang *et al.* 2001), red-slipped and black pottery	GX-28381	4000-3350 BP
Magapit	Red-slipped pottery (Aoyagi *et al.* 1997)	N5396	3350-2700 BP
Magapit	Red-slipped pottery (Aoyagi *et al* 1997)	N5397	3350-2700 BP
Magapit	On shell (Thiel 1989), red-slipped and black pottery	Gak-7048	4299-3713 BP
Pamittan	Layer 2 (Tanaka and Orogo 2000), red-slipped pottery	Gak-17967	3890-3390 BP
Pamittan	Layer 3 (Tanaka and Orogo 2000), red-slipped pottery	Gak-17968	4850-3650 BP
Dimolit	Layer 5 (Peterson 1974), red-slipped pottery	Gak-2939	3850-3250 BP
Dimolit	Layer 5 (Peterson 1974), red-slipped pottery	Gak-2938	6450-5250 BP

Cagayan Ceramic Chronology after Ogawa (2002)

Sites with red-slipped pottery and black pottery in the lower silty clay layer: Nagsabaran, Irigayen, Bangag, Catugan and Magapit



Plain Black

Black with decoration

Plain red-slipped

Red-slipped with decoration

Absolute Neolithic Chronology in N-Luzon (Carbon-14)

Site	Context (source)	Lab No.	Calibrated Date
Andarayan	~~14C date on rice husk in a red-slipped sherd (Snow *et al.* 1986)~~	~~unknown~~	~~4000-3350 BP~~
Conciso	Upper shell layer, On animal bone (Ogawa 2002), black pottery.	OOHM19	1190-1060 BP
Conciso	Lower shell layer ,On animal bone (Ogawa 2002), black pottery	OOHM16	2160-2000 BP
Bangag I	AMS date on organic material sealed in black pottery (Mihara *et al.* 2004)	NUTA2-5367	2310-2060 BP
Bangag I	AMS date on organic material sealed in black pottery (Mihara *et al.* 2004)	NUTA2-5368	2360-2300 BP
Irigayen	Shell layer, Charcoal (Ogawa 2002), black pottery	O-W8700	1520-1300 BP
Irigayen	Silty clay layer, Charcoal (Ogawa 2002), red-slipped and black pottery	NUTA2-914	3470-3340 BP
Irigayen	Silty clay layer, Charcoal (Ogawa 2002), red-slipped and black pottery	NUTA2-913	3470-3340 BP
Nagsabaran	Upper shell layer,		1520-1280 BP
Nagsabaran	Lower shell layer,		2500-1700 BP
Nagsabaran	Silty clay layer, charcoal (Tsang *et al* 2001), red-slipped and black pottery	GX-38379	3400-3000 BP
Nagsabaran	Silty clay layer, Charcoal (Tsang *et al.* 2001), red-slipped and black pottery	GX-28381	4000-3350 BP
Magapit	Red-slipped pottery (Aoyagi *et al.* 1997)	N5396	3350-2700 BP
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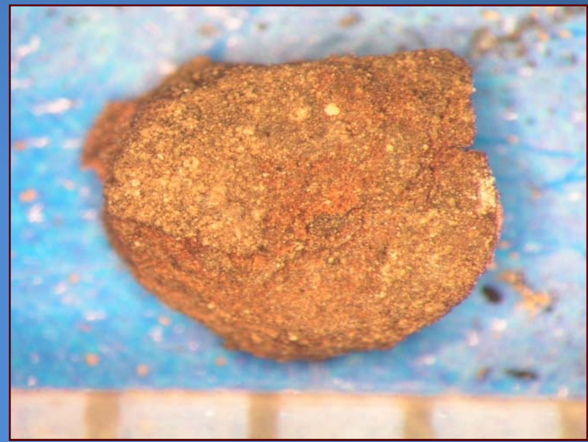
Magapit	~~On shell (Thiel 1989), red-slipped and black pottery~~	~~Gak-7048~~	~~4299-3713 BP~~
Pamittan	Layer 2 (Tanaka and Orogo 2000), red-slipped pottery	Gak-17967	3890-3390 BP
Pamittan	~~Layer 3 (Tanaka and Orogo 2000), red-slipped pottery~~	~~Gak-17968~~	~~4850-3650 BP~~
Dimolit	Layer 5 (Peterson 1974), red-slipped pottery	Gak-2939	3850-3250 BP
Dimolit	~~Layer 5 (Peterson 1974), red-slipped pottery~~	~~Gak-2938~~	~~6450-5250 BP~~

Chronometric Hygiene!

Matthew Spriggs, 1989.

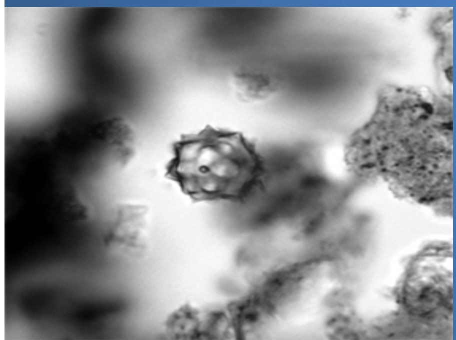
Botanical Remains

Wild ramie seeds

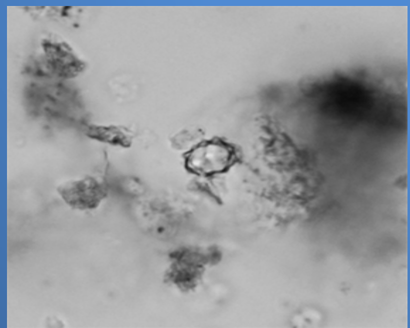


Parenchymatous tissue

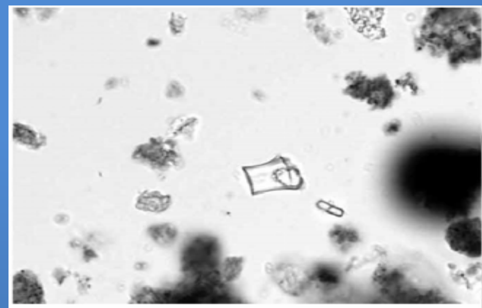
No evidence for rice farming!



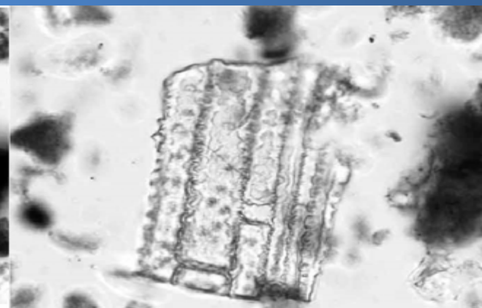
Phytolith of *Metroxylon sagu*



Phytolith resembling those of *Cocos nucifera*



Bamboo Phytolith (*Bambusoid*)

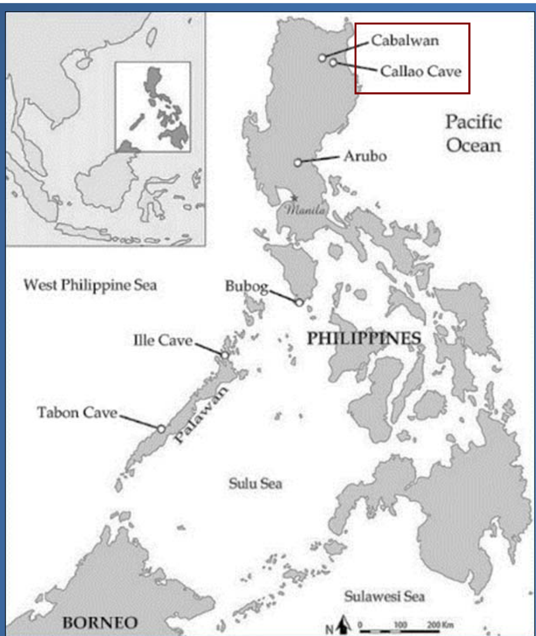


Sedge Phytolith (*Cyperaceae*)

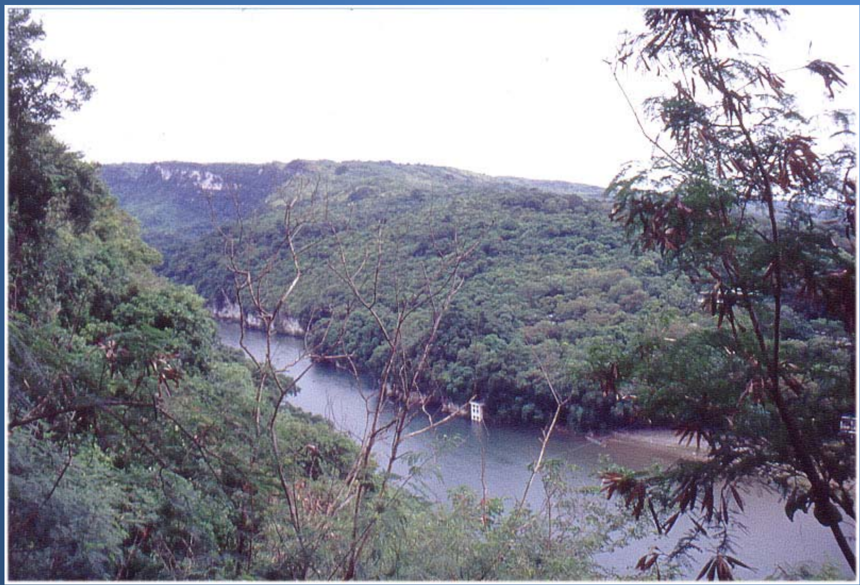
The "Austronesian Neolithic"

- Multiple movements from different areas in Taiwan started c. 4000 BP
- Black and red-slipped pottery contemporaneous around c. 3500 BP
- Lack of evidence for rice cultivation in Cagayan Valley.
- Rice farming might have been viable only after 2500 BP when shorter but more frequent El Niño–Southern Oscillations (ENSO) occurred
- The Peñablanca caves show continuing foraging subsistence with wild pigs and deer and wild roots, palms, nuts and other arboreal forest products.
- Use of plant fibres such as wild ramie, rattan, grasses, and sedges
- By 3000 BP sea level at present level, younger assemblages show an increase in estuarine and freshwater shellfish: Shell midden formation!
- Shell midden formation period shows the decline of red-slipped pottery and the dominance of black pottery

Palaeolithic in Cagayan Valley , N-Luzon



Cagayan Valley: Open sites



Peñablanca: Caves

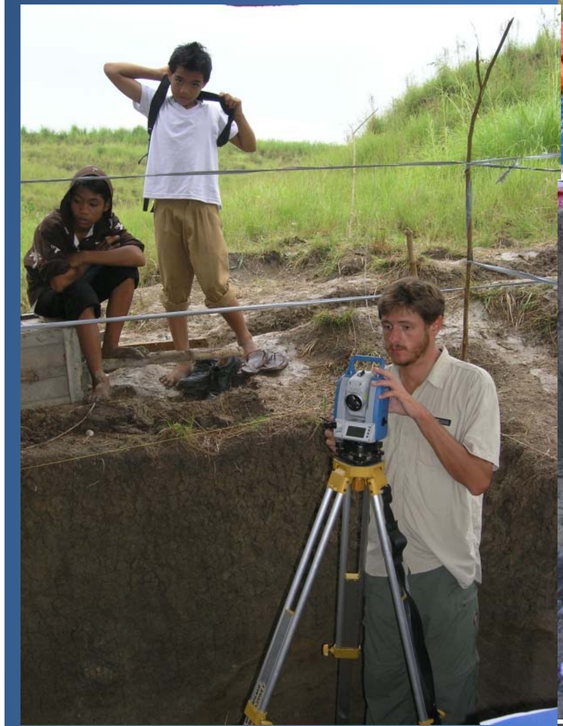
ap6

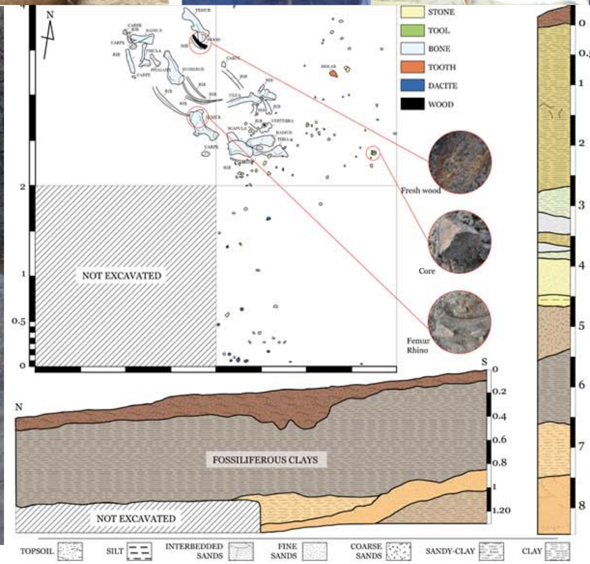
Palaeolithic in Cagayan Valley , N-Luzon

‘Cabalwanian’ (Koenigswald 1958)

- Retouched pebbles, flakes
- Few unifacial core tools
- Surface finds or near the surface
- Middle Pleistocene megafauna:
- Elephas, Stegodon, Rhinoceros etc.

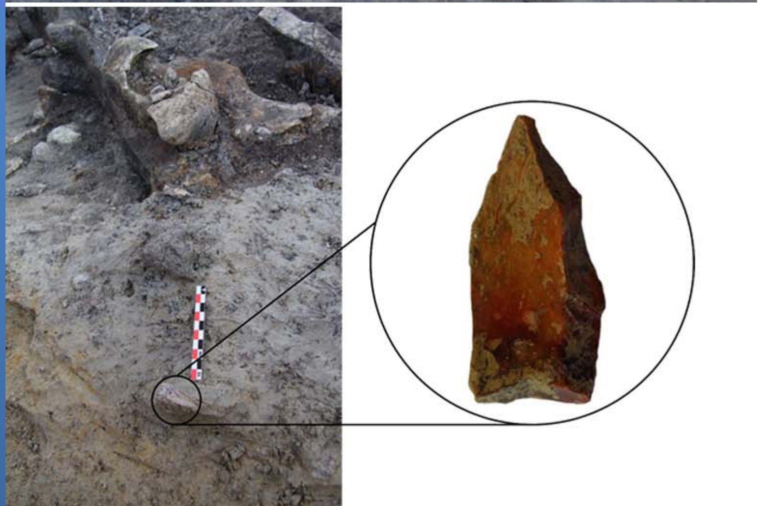
Pleistocene Megafauna in Cagayan Valley

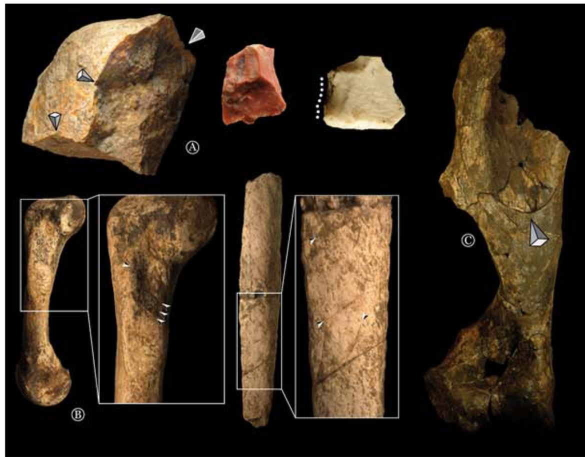




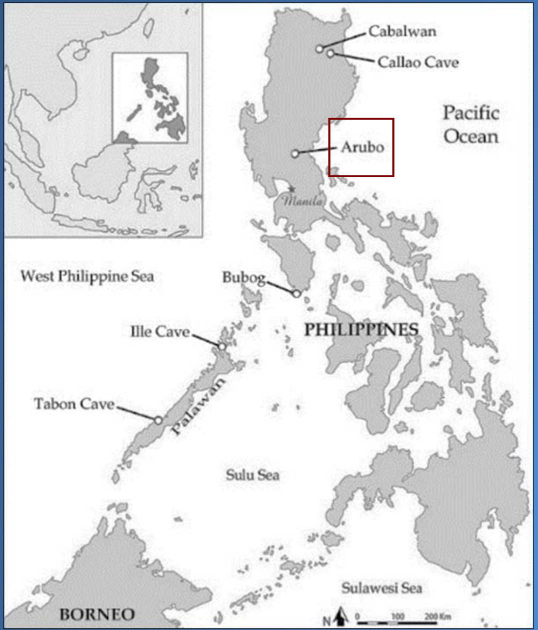
Espinosa, Kalinga: Recent excavations (Th. Ingicco) revealed a rhinoceros skeleton in context.
ESR, Ar/Ar: c. 0.6 – 1.0ma BP

Associated with stone tools?
Butchering marks?

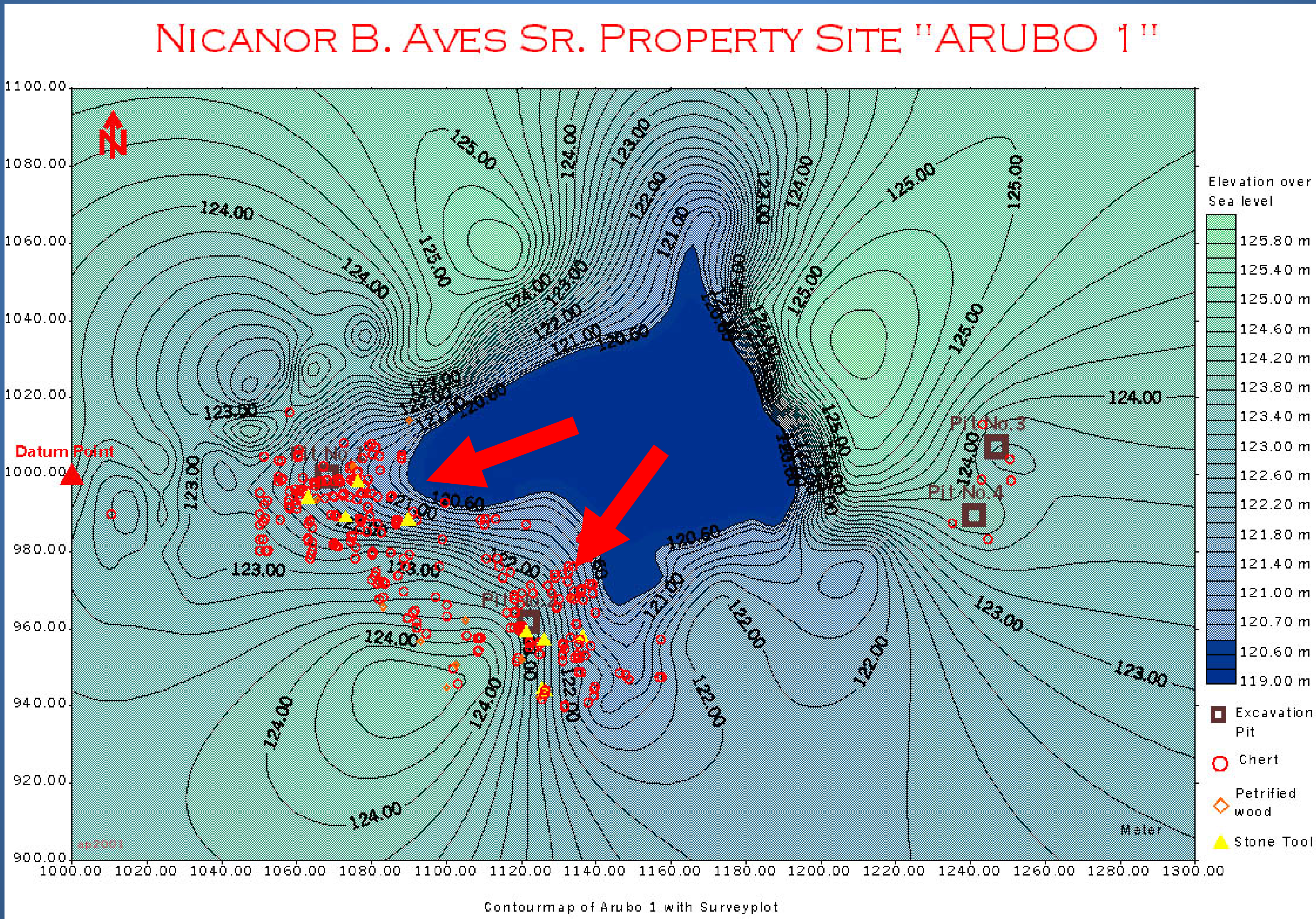




Arubo, Nueva Ecija, Central Luzon



Arubo 1: Two artefact concentrations

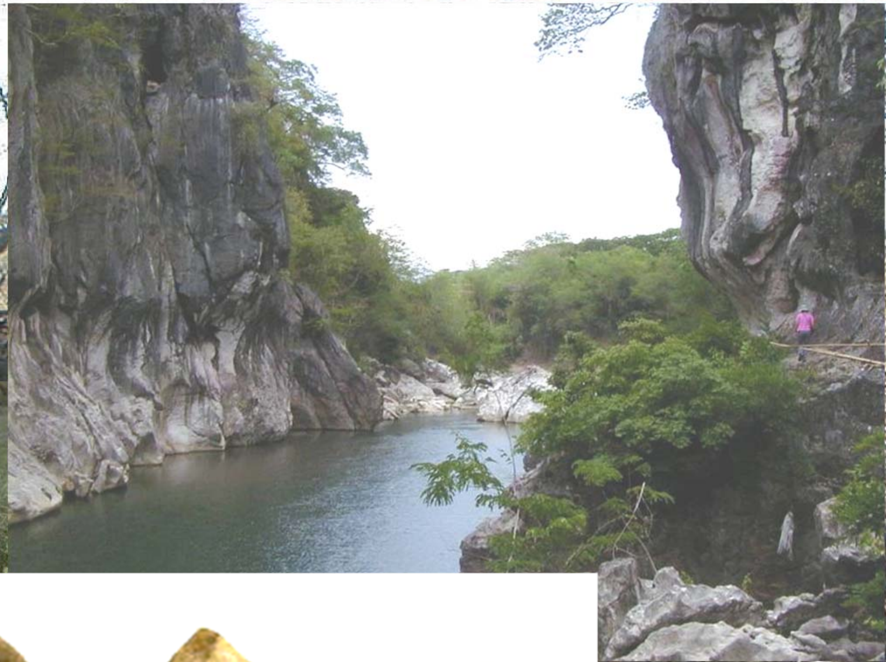


Arubo: Raw material source

- **Silex!**
  - **Local source**
  - **Fair quality**
  - **Accessible**

Arubo: Raw material source

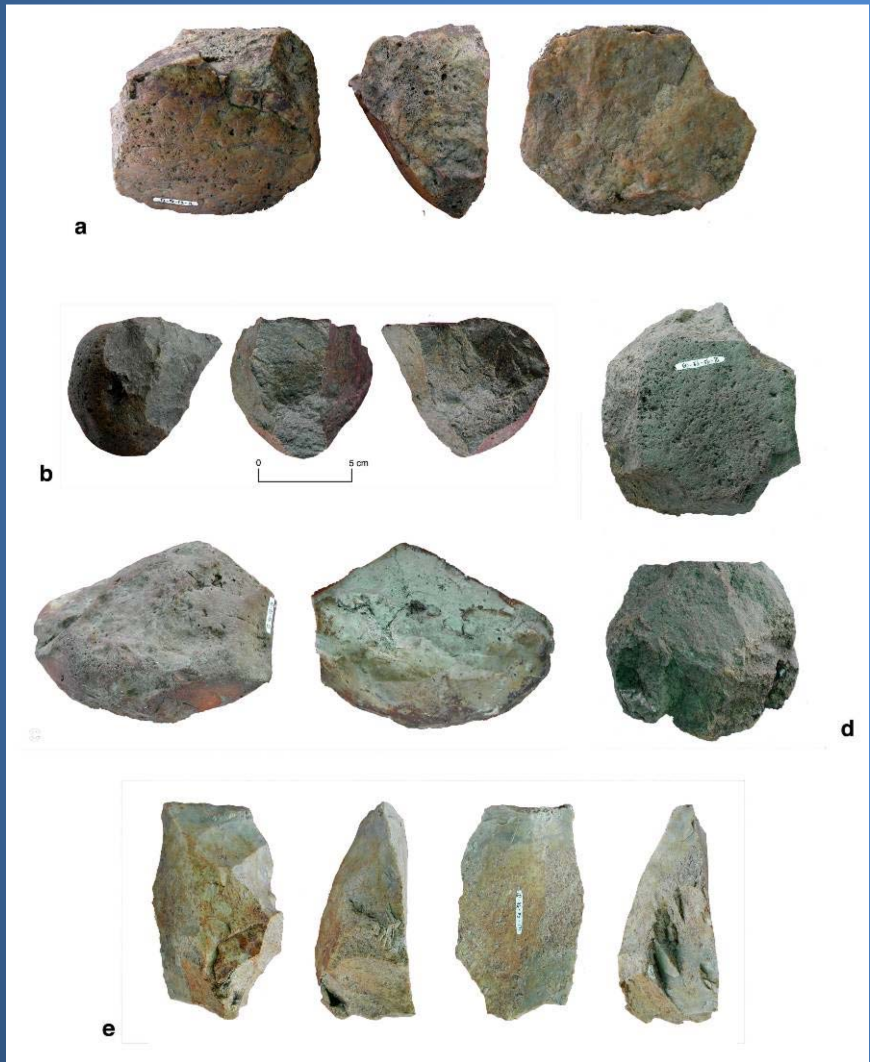


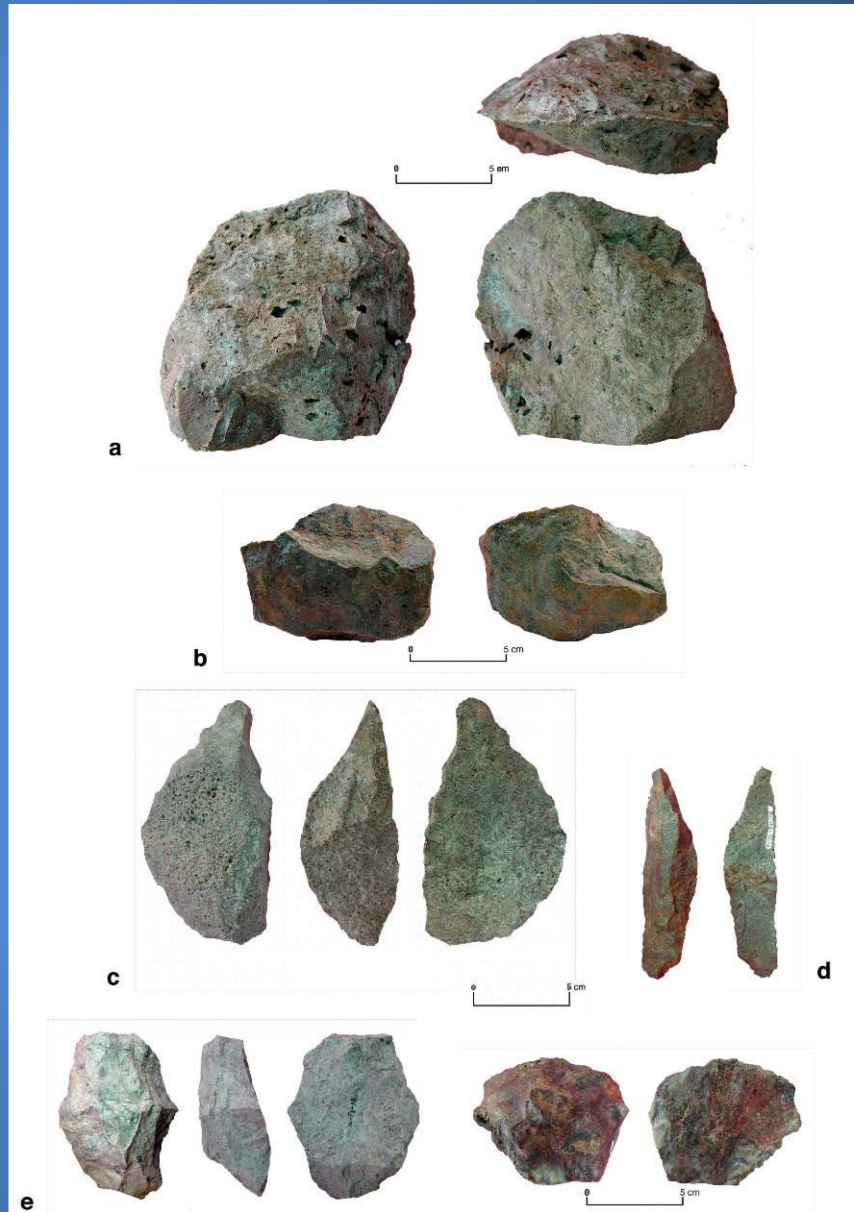


‘Cabalwanian’ artefacts from Northern Luzon made of ‘Arubo chert’ (Teodosio 2005)

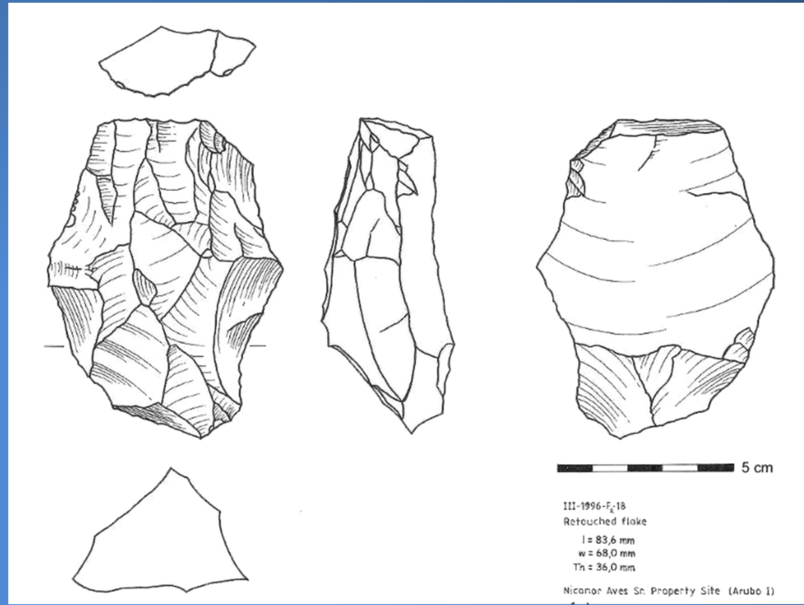
- **Silex!**
  - **Local source**
  - **Fair quality**
  - **Accessible**

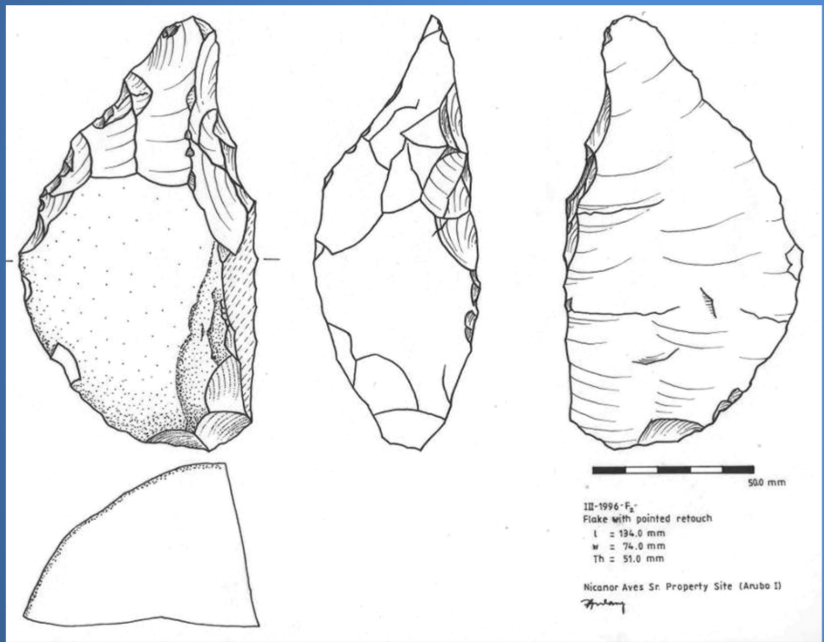
Arubo: Artefacts

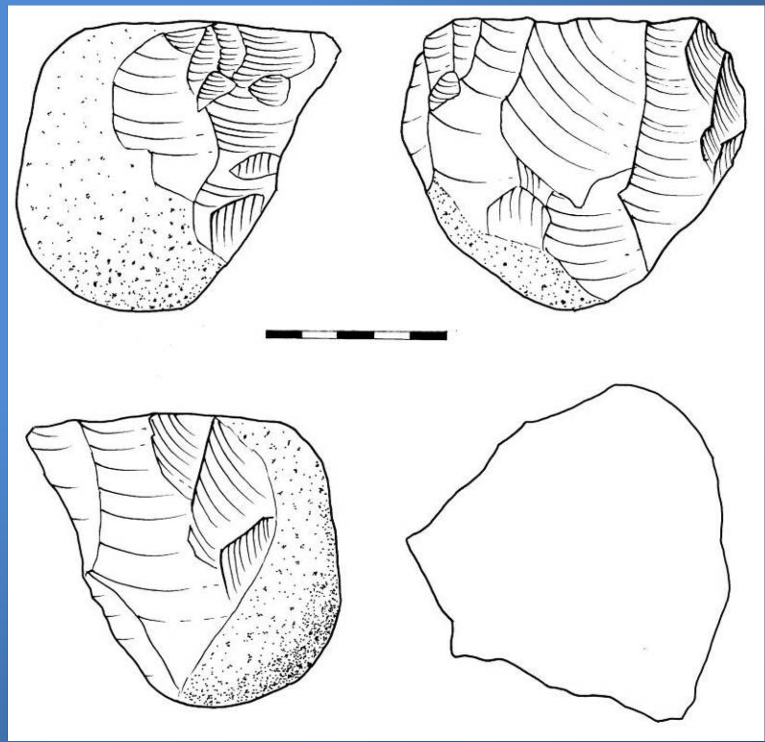




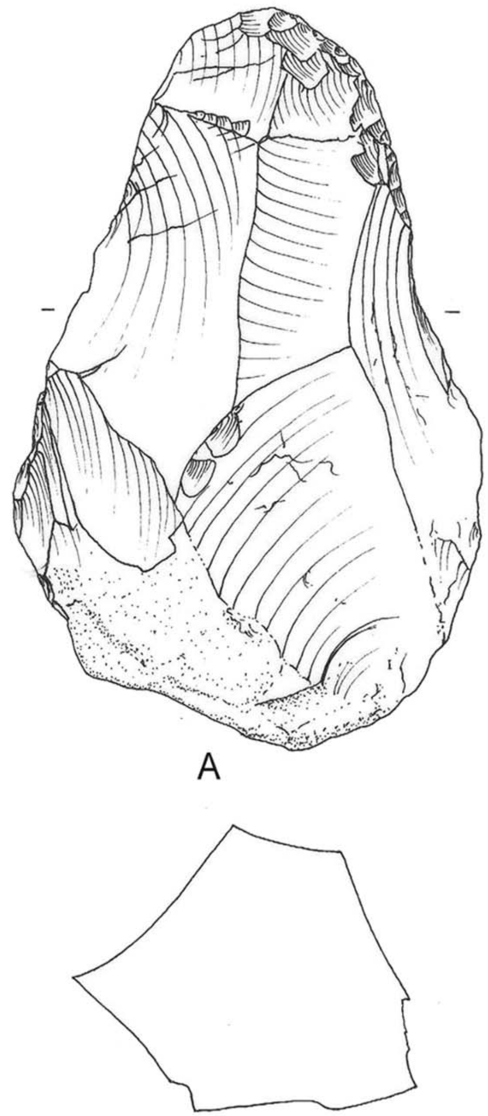
Arubo: Artefacts

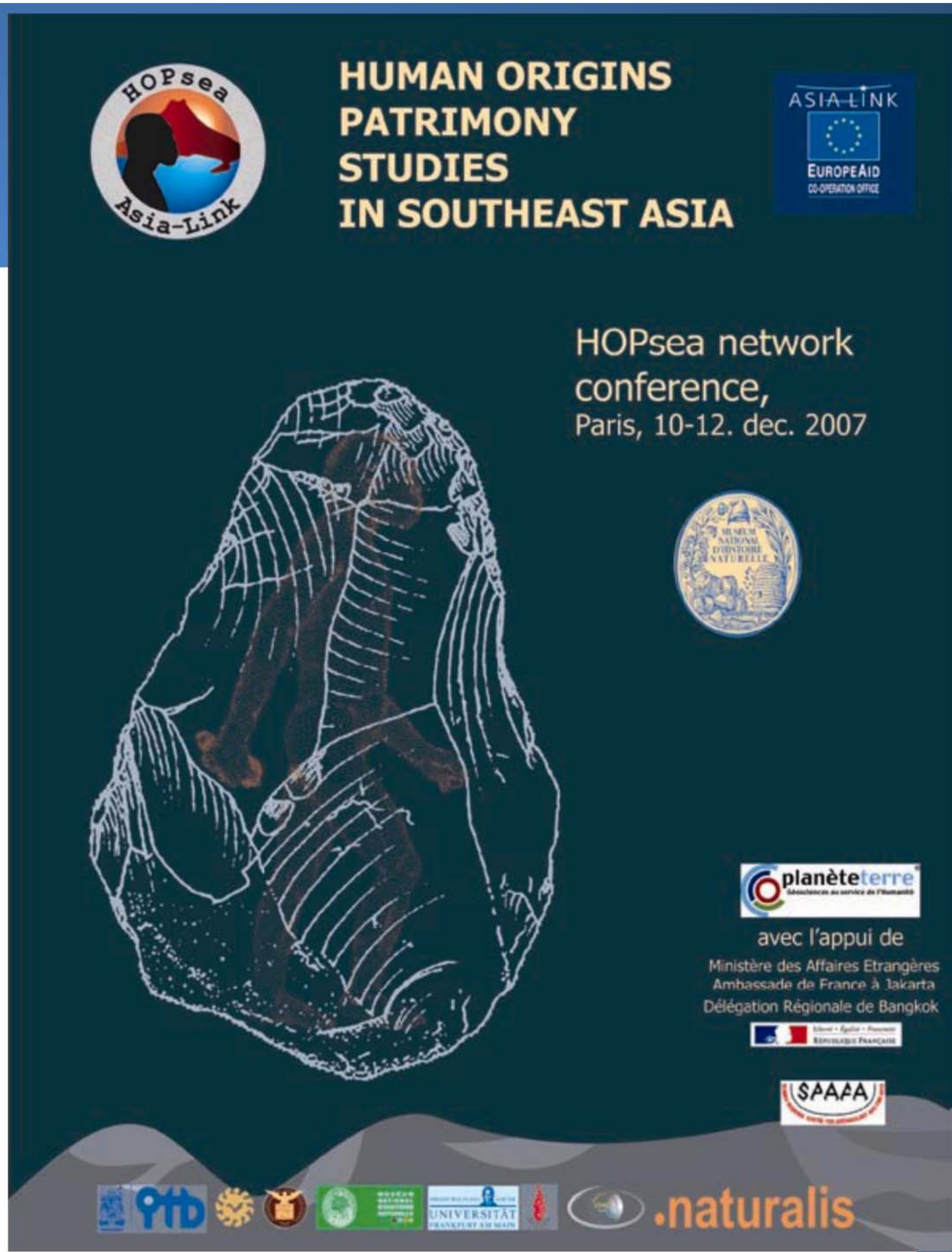






Arubo: Handaxe

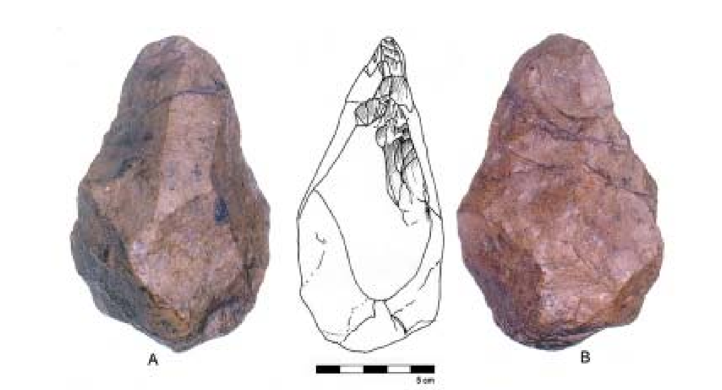




Arubo: Handaxe

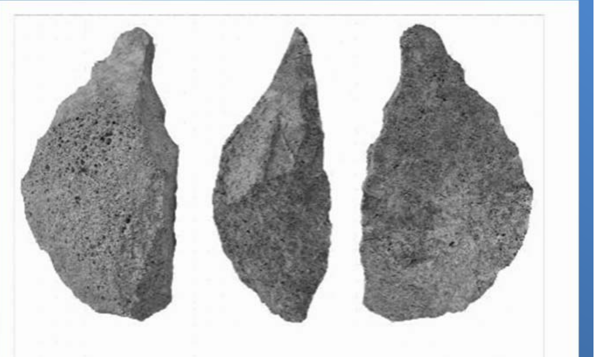
Although no direct dating is available, morphological and technological comparison with other assemblages in the region permits us to establish a formal similarity with lithic artefacts from LOWER PALAEOLITHIC sites in the Region, proposing a similar age range:

- South China, e.g. Bose Basin (0.8ma BP)
- Thailand, e.g. Lampang (E/MPL)
- Central Vietnam, e.g. Roc Tung (0.7-0.9ma BP)
- Indonesia, e.g. Sangiran (>1ma BP) and
- Soa Basin sites on Flores Island (0.8-1ma BP)



Arubo, Central Luzon (Pawlik 2002)


Fengshudao, Bose Basin (Wang et al. 2014)


Arubo, Central Luzon (Pawlik 2002)


Roc Tung, Central Vietnam (Derevianko 2016)

Early Peopling of the Philippine Archipelago

Island Southeast Asia holds a huge potential to challenge many of the current theories on human colonization and evolution.

Homo floresiensis, c. 60-100 kya

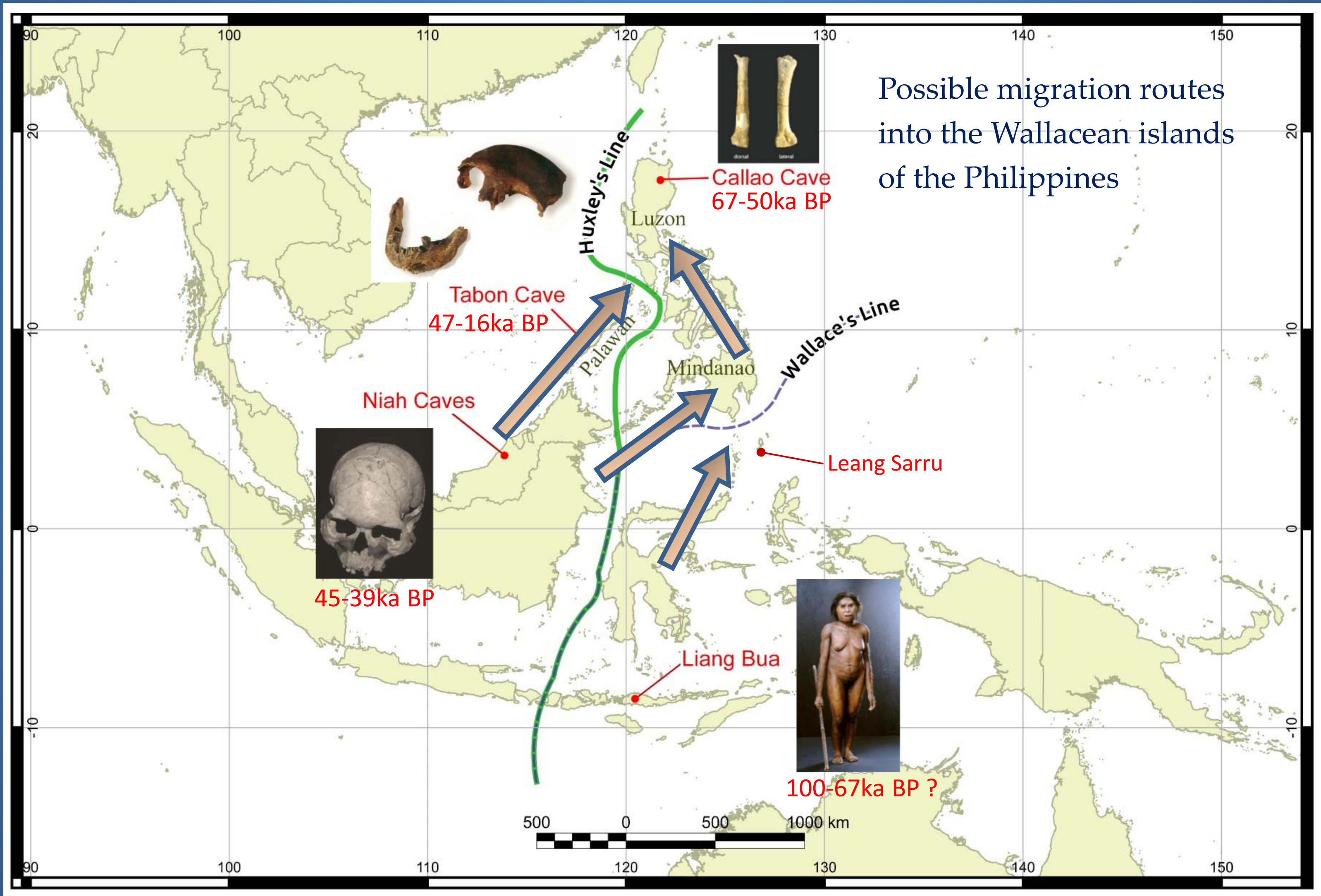
The Philippines have produced early evidence for human migration into Island Southeast Asia:

Tabon Cave, Palawan: Upper Palaeolithic assemblages and human fossil remains dated to up to ca. 35-50ky BP.

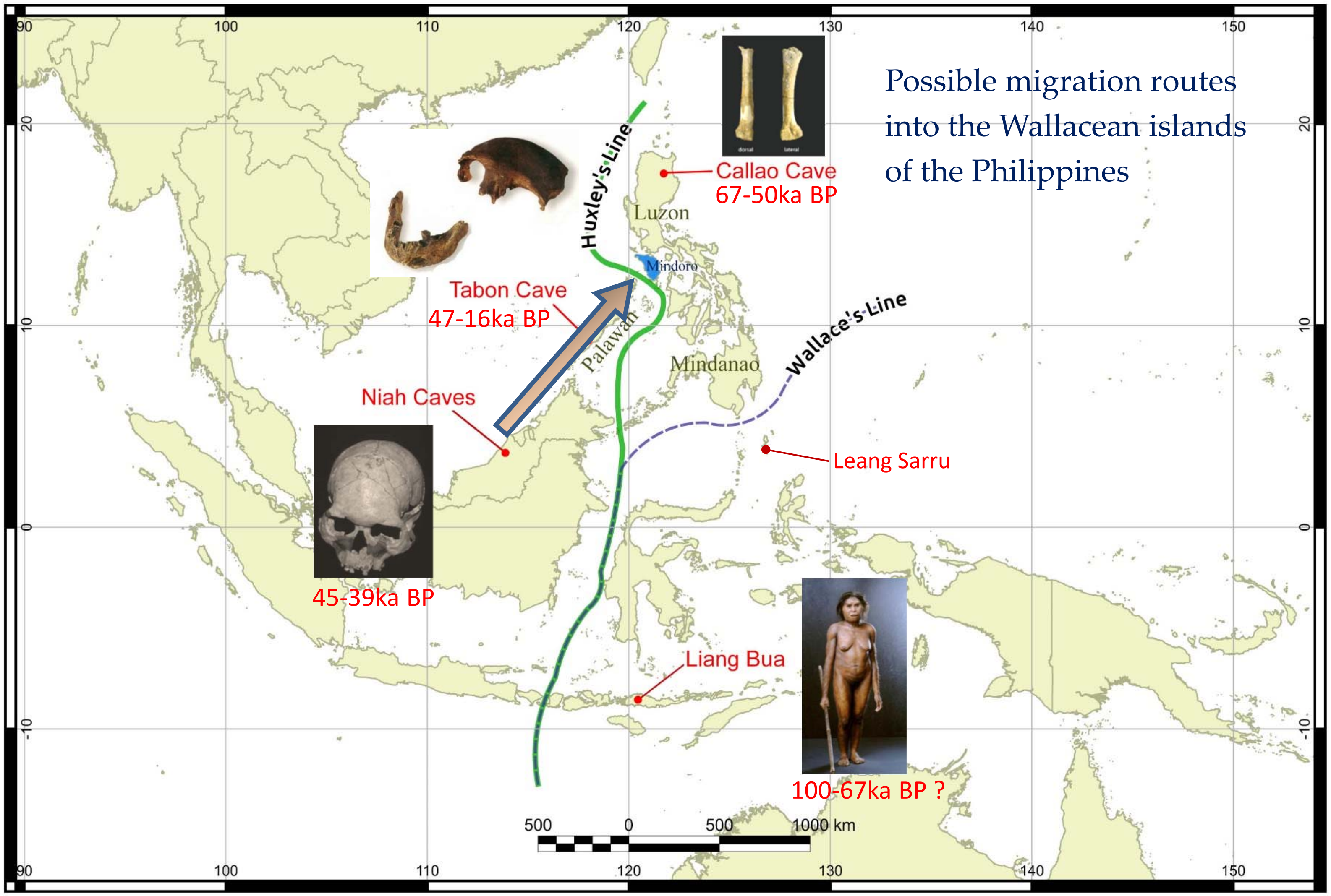
Callao Cave, Peñablanca, northern Luzon: Discovery of a human 3rd metatarsal and tooth dated to 67ky and 50ky BP.

Détroit et al. 2004; Mijares, et al. 2010; Grün et al. 2014

Early Peopling of the Philippine Archipelago



Early Peopling of the Philippine Archipelago



Archaeological Research in Mindoro

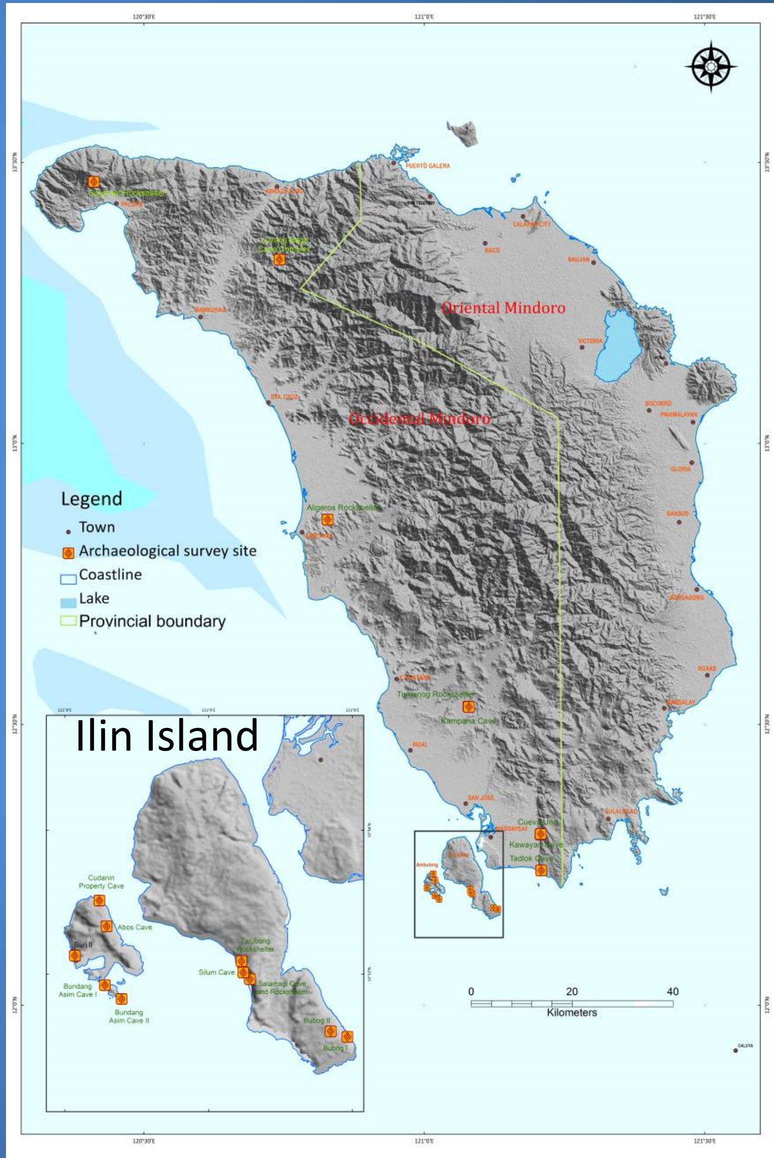
More than 40 sites have been found and surveyed on Mindoro until Feb 2015



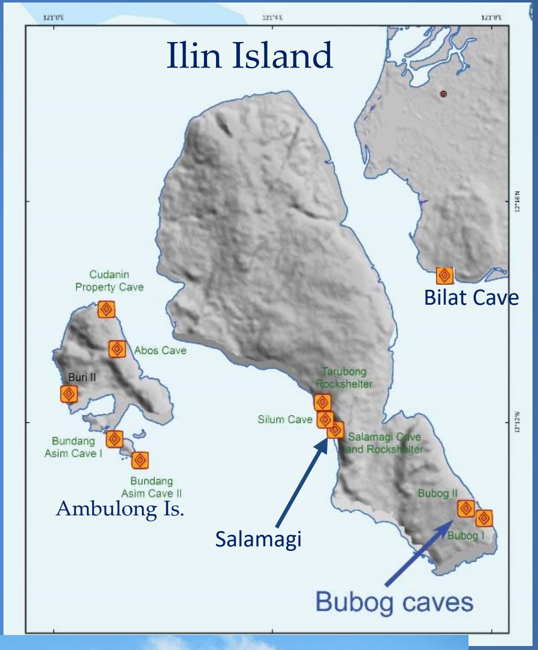

Archaeological Research in Mindoro

One main surveying area is the island of Ilin in SW-Mindoro

Oriented southeast-northwest, ca. 17 km in length and a max. breadth of 7 km, and consists primarily of karstic limestone with some igneous geology in its northeastern corner.
At present Ilin and Mindoro are separated by a 900-1300 m wide channel.

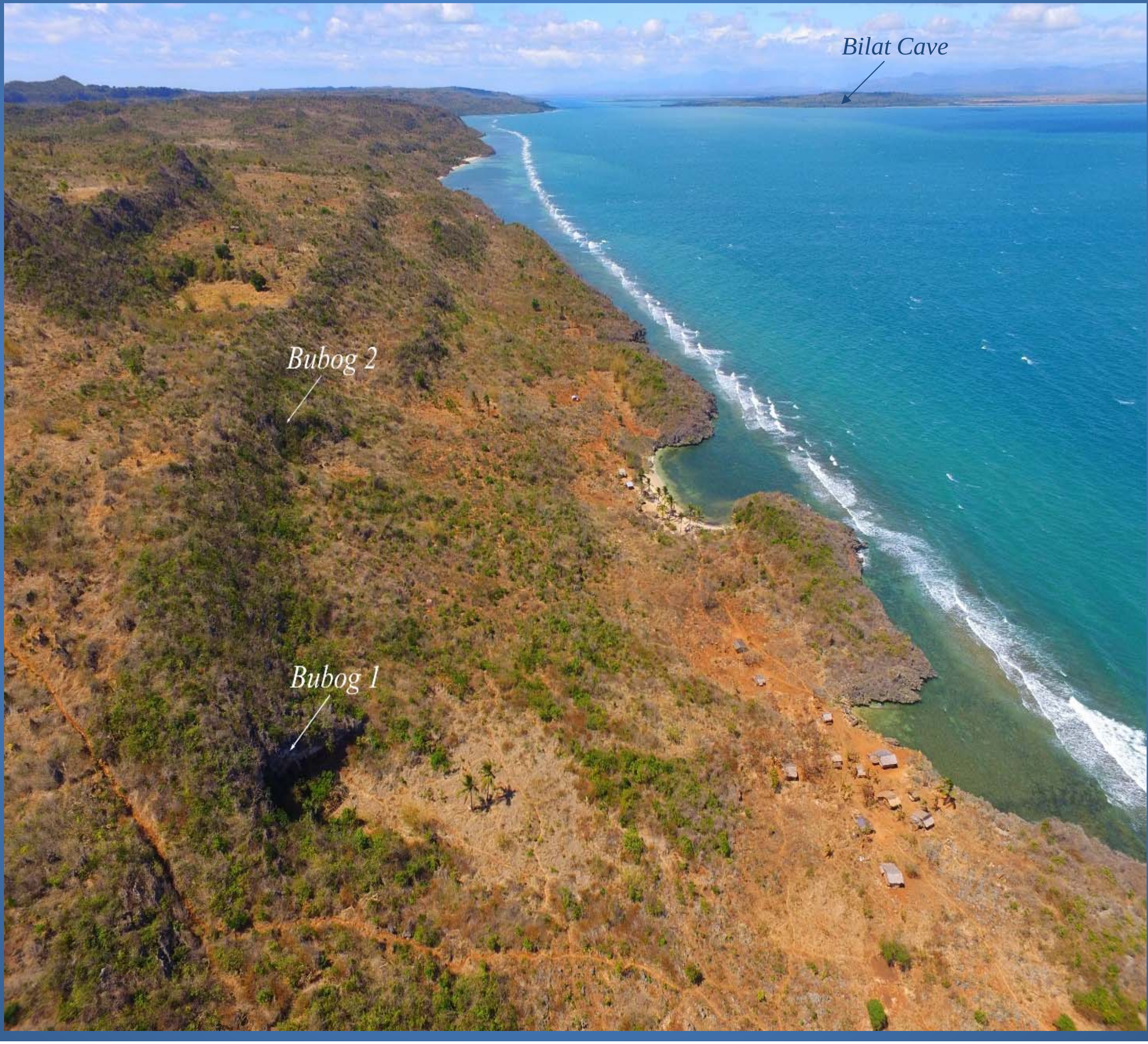


Archaeological Research in Mindoro – Ilin Island



Archaeological Research in Mindoro

A main surveying area is Ilin Island in SW-Mindoro



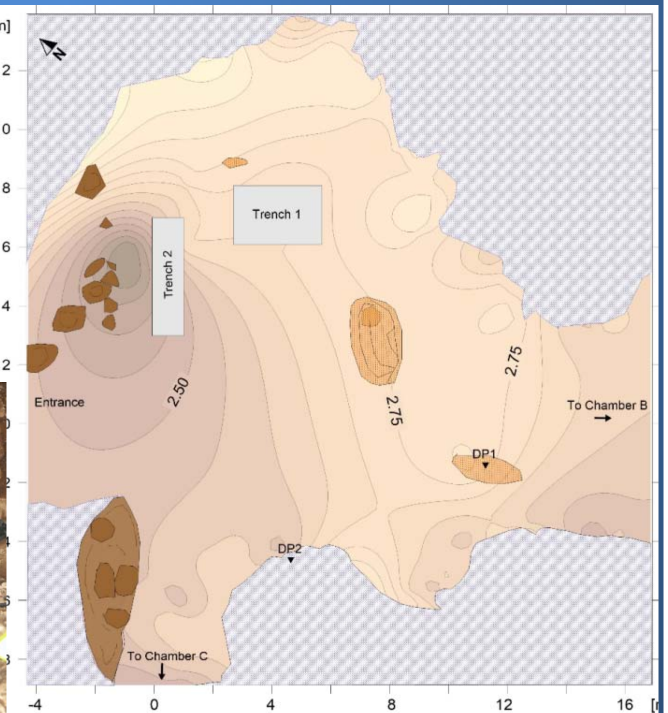
Archaeological Research in Mindoro

Archaeological Research in Mindoro – Santa Teresa

Bilat Cave

Mindoro Coast opposite of Ilin Island
3 chambers. One opens to the land side, two with openings to the sea

Land side cave covered with shell midden deposits



Archaeological Research in Mindoro – Santa Teresa

Bilat Cave

Mindoro Coast opposite of Ilin Island
3 chambers, one opens to the land side, two with openings to the sea

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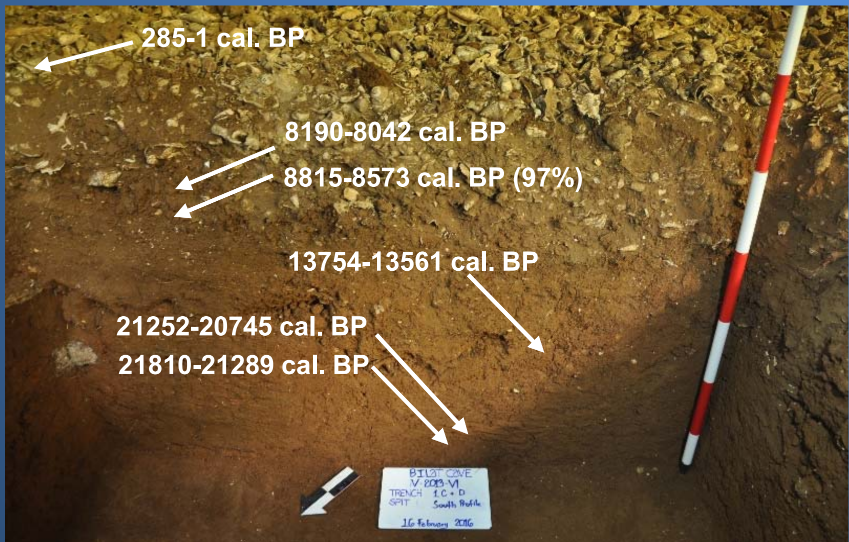
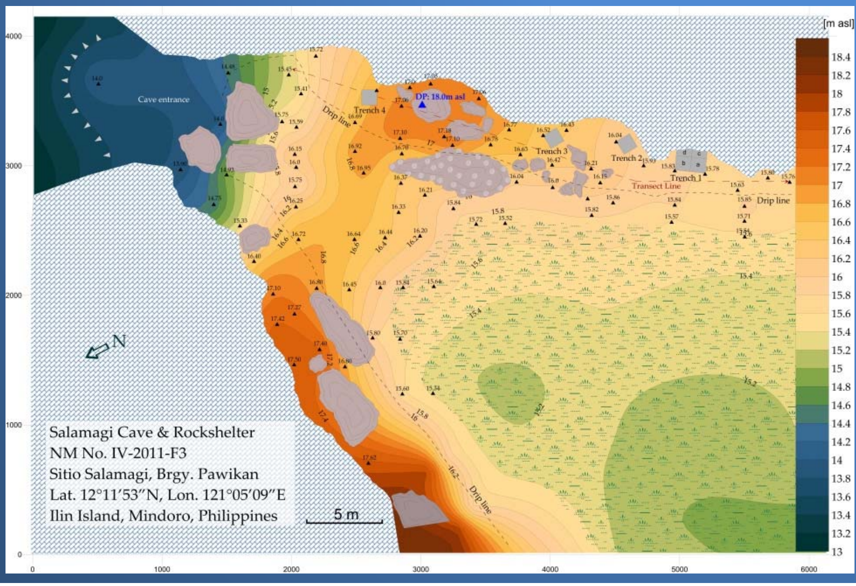
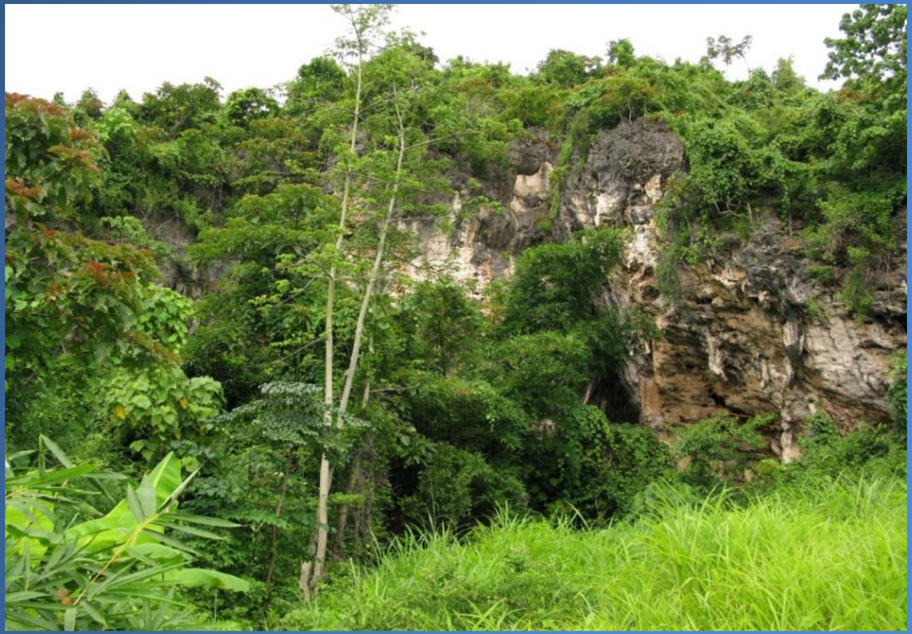


Archaeological Research in Mindoro

Bubog sites were found during our initial fieldwork on the W-coast of Ilin at Salamagi, a ca. 40m long rockshelter with narrow platform in front of a deep bat cave.

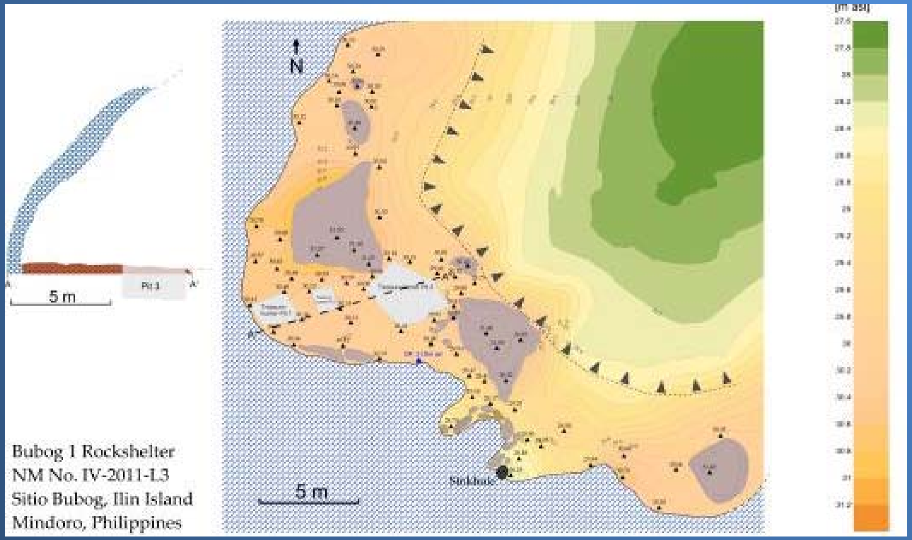


Archaeological Research in Mindoro



BUBOG 1
Rockshelter / Cave

U-shaped habitation platform,
separated into 3 sectors by massive rockfall



Archaeological Research in Mindoro

BUBOG 2 Rockshelter

Habitation platform protected by rockfall to the seaside

Archaeological Research in Mindoro – Ilin Island

Bubog 1:

Shell midden exposed by treasure hunters diggings.

Mostly pre-ceramic deposits – stratified shell midden with 9 distinctive layers

Archaeological Research in Mindoro – Ilin Island

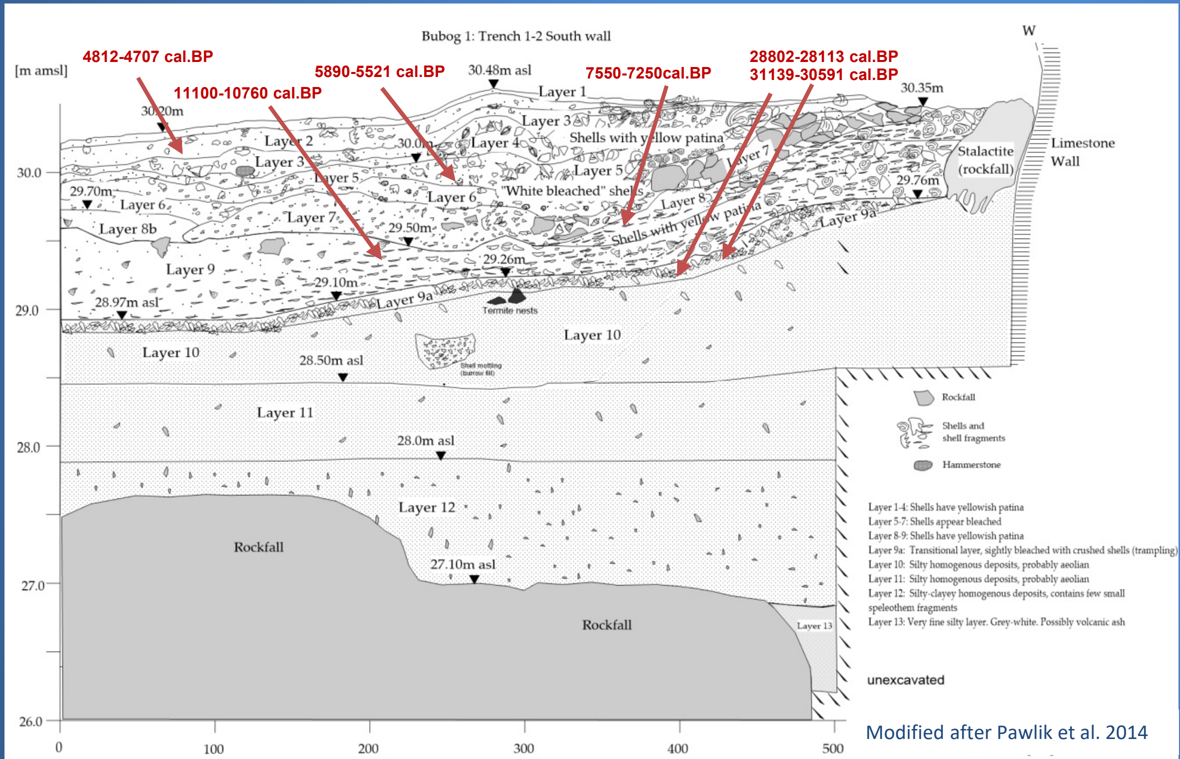
Bubog 1:

Shell midden exposed by treasure hunters diggings.
Mostly pre-ceramic deposits – stratified shell midden with 9 distinctive layers

Stratified shell midden in Bubog 1, Ilin Island

^{14}C-dating of the upper layer 4: **4290 - 4081 cal BP**

^{14}C date at the base of shell midden: **31138 - 28113 cal BP**. Over 2m of Pleistocene cultural layers underneath the midden (2016)



Modified after Pawlik et al. 2014

Sea level regression and environmental changes visible in the stratigraphy: Shift from deeper dwelling marine sea shells (e.g. *Nautilus*) in the upper layers to dominantly mangrove dwellers (e.g. *Batissa sp.*) and estuarine shells (*Geloina coaxans*) in the lower layers of the shell midden

Ilin Island
Coastline around 4 KA

Projection: Geographic
Datum: PRS 92

Legend

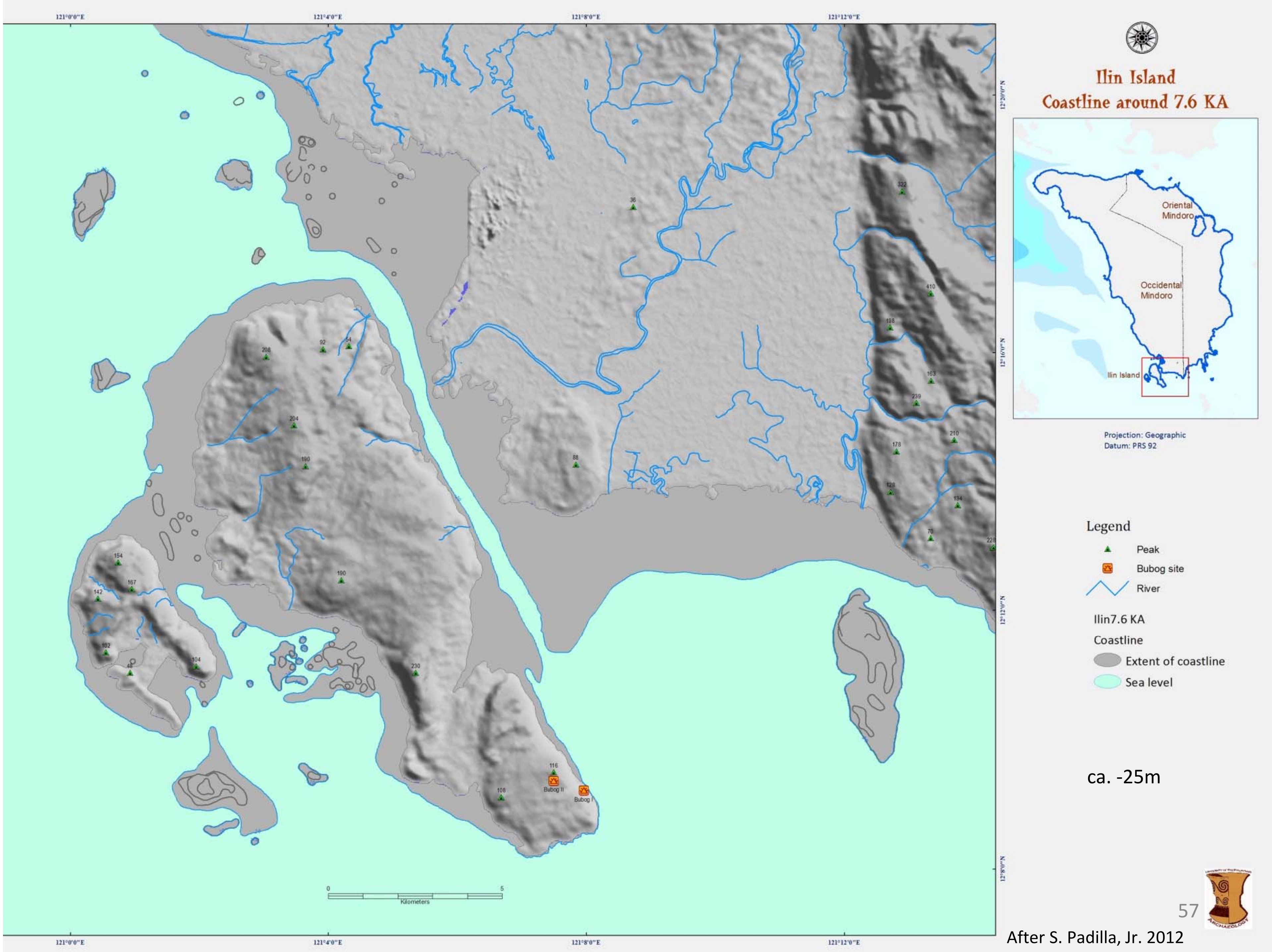
- Peak
- Bubog site
- River

Ilin 4 KA

Coastline

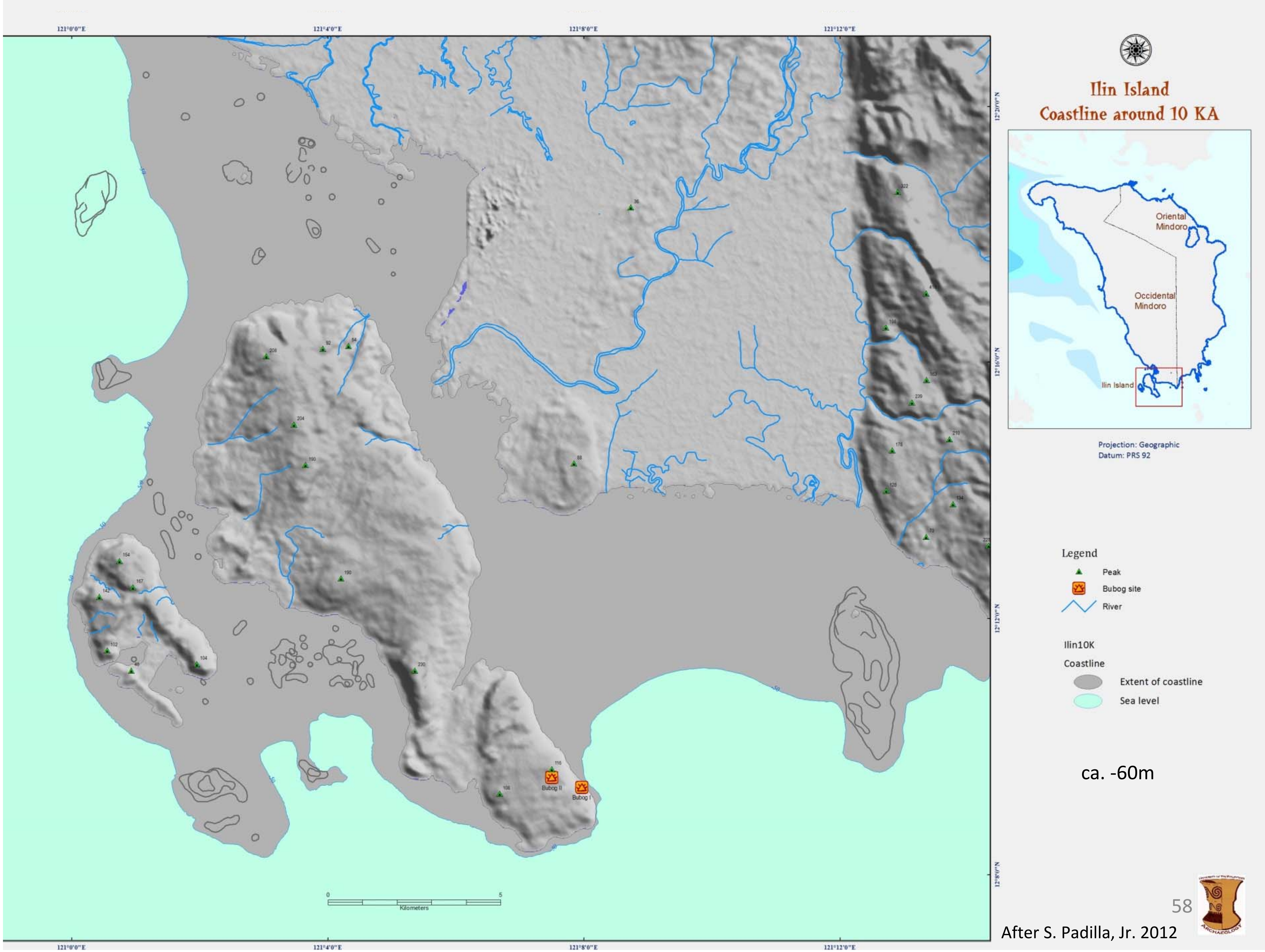
- Extent of coastline
- Sea level

After S. Padilla, Jr. 2012



ca. -25m

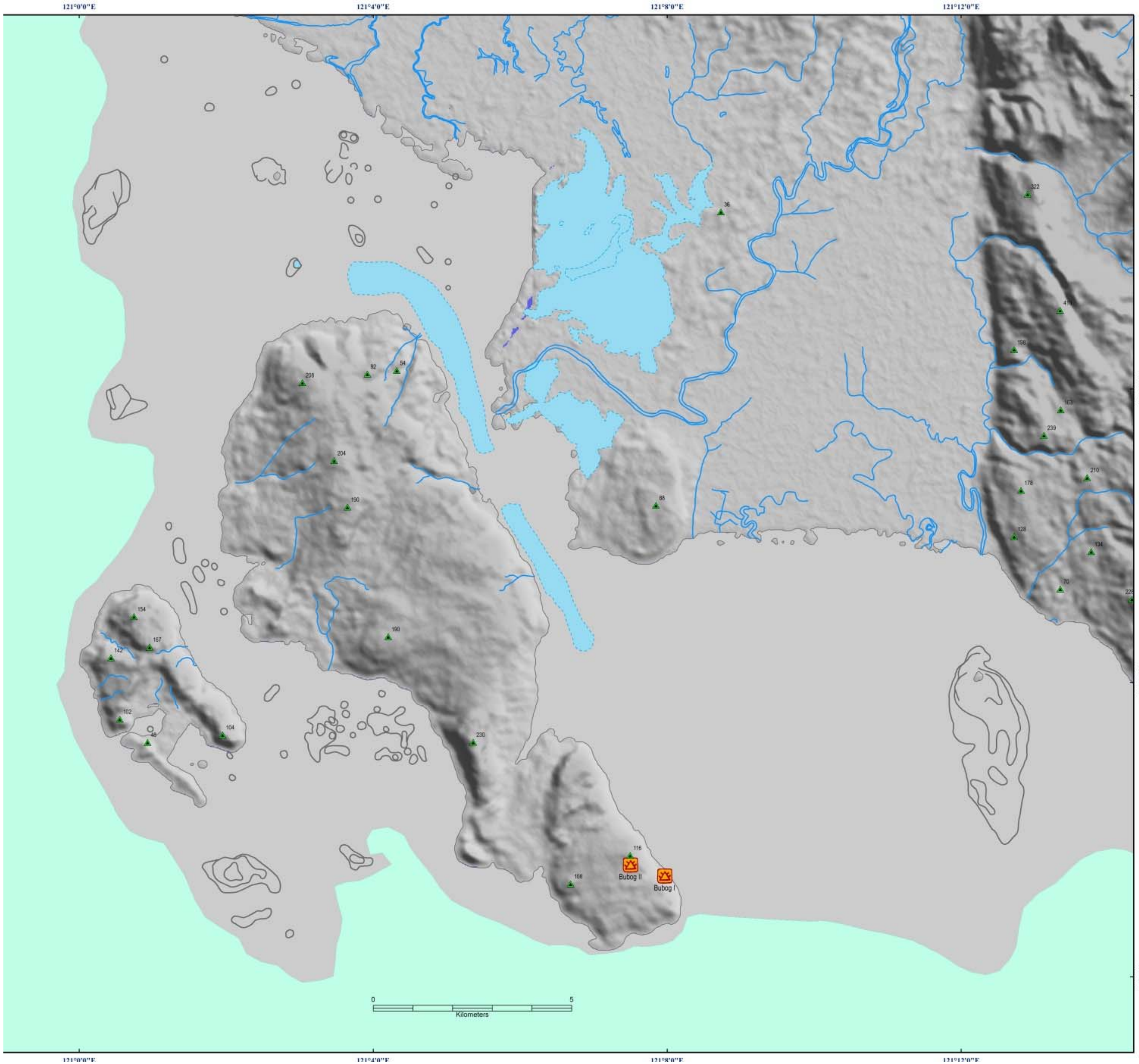
After S. Padilla, Jr. 2012



ca. -60m

After S. Padilla, Jr. 2012

Ilin Island
Coastline around 18 KA



Projection: Geographic
Datum: PRS 92

Legend

- Peak
- Bubog site
- River
- Paleo-lake

Ilin 19-14.6 K coastline

Name

- Present coastline
- 18 K coastline
- >100 m

ca. -100m

After S. Padilla, Jr. 2012

Ilin Island Coastline around 18 KA

Projection: Geographic
Datum: PRS 92

Legend

- Peak
- Bubog site
- River
- Paleo-lake

Ilin 19-14.6 K coastline

Name

- Present coastline
- 18 K coastline
- >100 m

ca. -100m

After S. Padilla, Jr. 2012

Archaeological Research in Mindoro – Ilin Island

Marine Vertebrate Fauna of Ilin Island
(Clara Boulanger)

Coral reef fishes
(Layer 1 to layer 12)


Balistidae


Nemipteridae


Diodontidae


Labridae


Ostraciidae

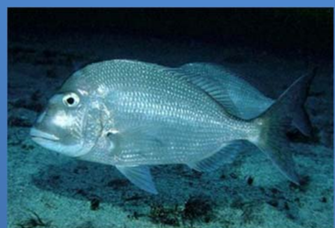

Lutjanidae


Muraenidae


Scaridae


Serranidae


Tetraodontidae


Sparidae

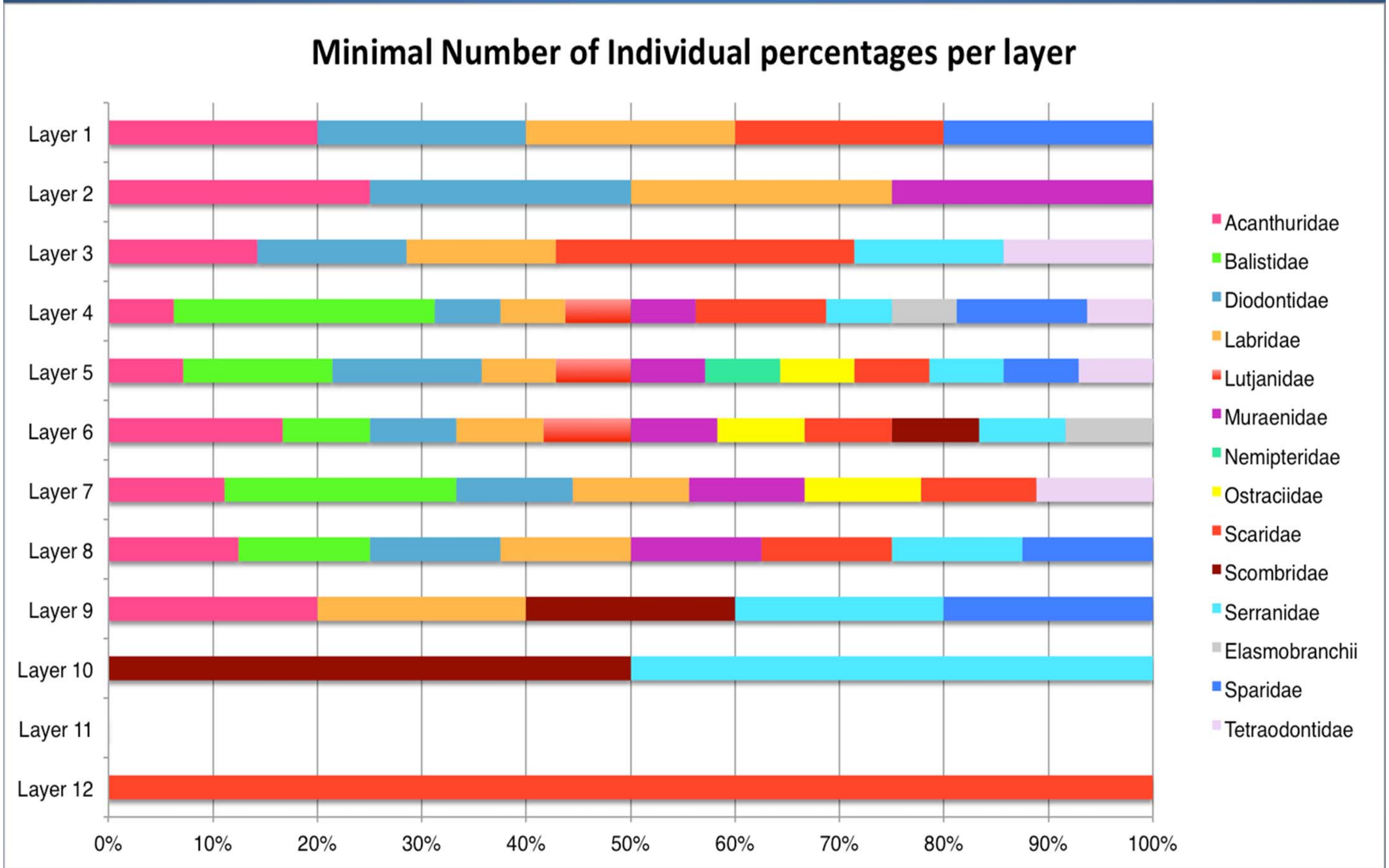

Acanthuridae

Inshore fishes
(Layer 8 to 10)


Scombridae


Large Serranidae

⇒ **Mangrove**
⇒ **Pelagic area**


Minimal Number of Individual percentages per layer
Layer 1
Layer 2
Layer 3
Layer 4
Layer 5
Layer 6
Layer 7
Layer 8
Layer 9
Layer 10
Layer 11
Layer 12
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Acanthuridae
Balistidae
Diodontidae
Labridae
Lutjanidae
Muraenidae
Nemipteridae
Ostraciidae
Scaridae
Scombridae
Serranidae
Elasmobranchii
Sparidae
Tetraodontidae

Archaeological Research in Mindoro – Ilin Island

Preliminary results on fish bones from Bubog I

(Clara Boulanger)

NRT = 1401, NISP = 384

Significant part of the diet

Charred bones

High diversity of taxa : 4 orders / more than 14 families

Mostly coral reef fishes (however juveniles can be found in shallow water) throughout the stratigraphy

Scombridae bones in the lower layers suggest **pelagic fishing**

Capacity of sailing far from the coast ?

Diversity of sizes: Osteometry as an approach for the reconstruction of fishing techniques and behaviour

Burnt *Diodon* sp.
(porcupine fish) dermal spines

Preparation of a fugu (Tetraodontidae)
Remains appear in Layers 3-7

Scarus sp. (Scaridae)

Burial at Bubog 1

The first prehistoric human burial uncovered in Mindoro

After the skull cap was uncovered, 'en bloc' retrieval of the poorly preserved skeletal remains

Preparation and Analysis by Dr. Rebecca Crozier, Human Osteology Laboratory of ASP

Extremely flexed position

No grave goods nor pottery or other artefacts.

Radiocarbon date on tooth enamel: 4843-4704 cal. BP (S-ANU 41027).

The Burial at Bubog 1

Analysis of a human burial from Bubog 1
(Dr. Rebecca Crozier)

Ribs

Vertebra

Cranium

Vertebrate Fauna of Ilin Island

Preliminary results on macromammals

(Philip Piper, et al.)

3 endemic species of Mindoro
- *Sus oliveri* (around 98%)
- *Bubalus mindorensis* (around 2%)
- *Rusa marianna* (molar)

Distribution all along the stratigraphy but lower proportions than the marine resources

Burnt bones and cut marks

No domestic pig

Animals possibly hunted on Mindoro then brought back to Ilin

⇒ Interaction between the two islands even during high sea levels periods

Sus oliveri

Bubalus mindorensis (Tamaraw)

Rusa marianna

Vertebrate Fauna of Ilin Island

Preliminary results on macromammals

(Philip Piper, et al.)

4 endemic species of Mindoro

- *Sus oliveri* (around 98%)
- *Bubalus mindorensis* (around 2%)
- *Rusa marianna* (molar)
- *Cervus alfredi* (phalange)

Distribution all along the stratigraphy but lower proportions than the marine resources

Sus oliveri

Bubalus mindorensis
(Tamaraw)

Cervus alfredi
(Philippine Spotted Deer)

Rusa marianna

Vertebrate Fauna of Ilin Island

Analysis of microvertebrate remains
(Marian C. Reyes)

Dental and skeletal remains of numerous species of rodents, bats, shrews, lizards, snakes, frogs and turtles

Preliminary analysis of vertebrates demonstrate a shift in foraging strategy in Bubog I Layer 10: invertebrates → vertebrates

Fkhorqlgdh	Ydudqlgdh	Vhushqwhv	Fklurswhud	Pxulgdh	OD\HU	Fkhorqlgdh	Vtxdpdwd	Vhushqwhv	Fklurswhud	Pxulgdh
					4					
					5					
					6					
					7					
					8					
					9					
					:					
					;					
					<					
					43					
					44-					
					45-					
					46-					
					47-					
EXERJ#L						EXERJ#LL				

Vertebrate Fauna of Ilin Island

Ilin Island Cloudrat *(Crateromys paulus)*

(Marian Reyes)

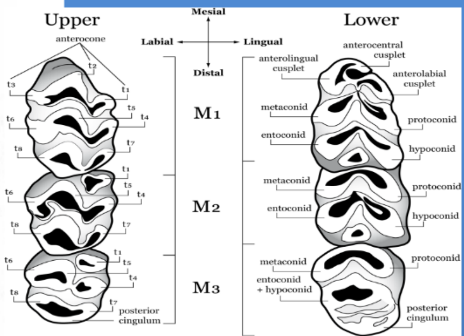
Musser and Gordon 1981

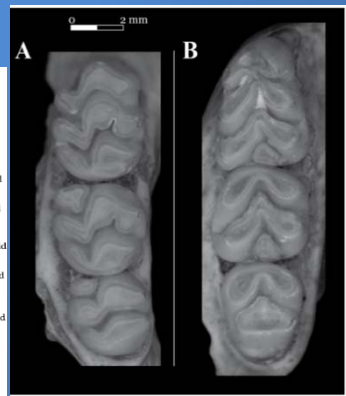
Remains of an extinct cloudrat species endemic to Ilin Island found within the archaeological layers from Bubog

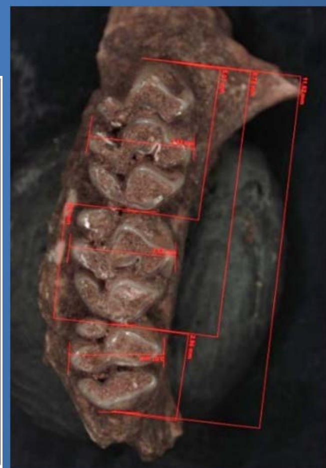
96 specimens attributed to *C. paulus*

Confirms provenance of the holotype collected in 1953, described in 1981

Abundant in the past: from before 30,000 to around 500 years ago







Morphological and morphometric study of micro-vertebrate remains

Reyes, et al. 2017. First fossil evidence of an extinct cloud rat (Crateromys paulus) from Ilin Island, Mindoro (Philippines). Proceedings of the Biological Society of Washington

Palaeobotany of Ilin Island

Analysis of plant macro-remains of Bubog 1 and 2

(Jane Carlos)





Seeds



Parenchyma


Wood

Canarium

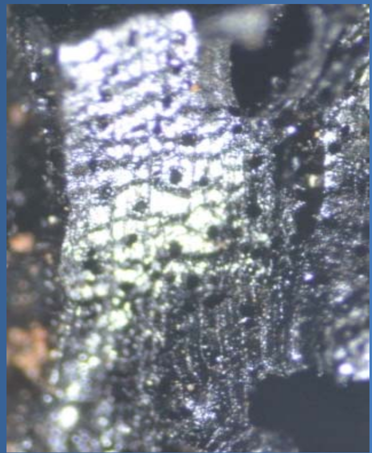

Charred nuts


Macaranga sp.

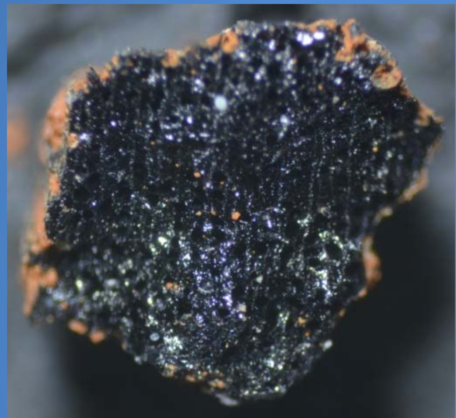
Palaeobotany of Ilin Island

Wood Analysis

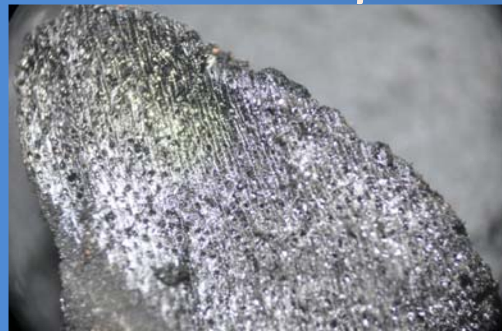
Family Fabaceae



Family Sapotaceae
Palaquium sp.



Family Burseraceae
Canarium sp.

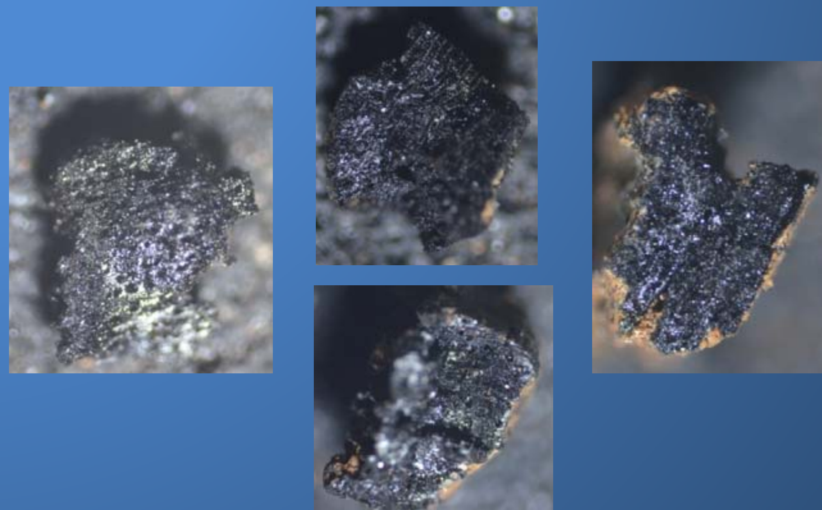


Family Rhizophoraceae

Family Anacardiaceae
Pistacia chinensis

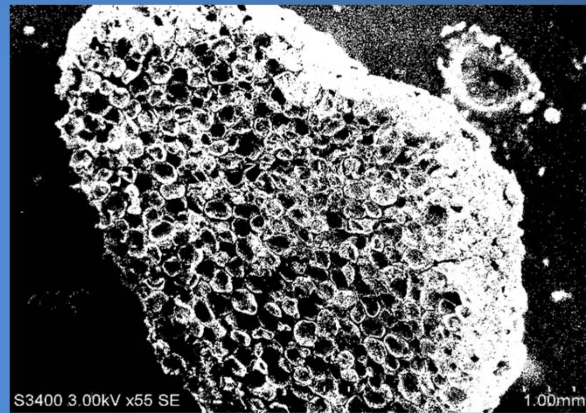
Family Verbenaceae
Avicenna sp.

Family Dipterocarpaceae
Shorea sp., Vatica sp., Dipterocarpus sp.



Archaeological Research in Mindoro – Ilin Island

Canarium hirsutum
10,760-11,100 cal BP



cf. *Dioscorea alata* (yam)

Archaeological Research in Mindoro – Ilin Island

- Shell remains associated with a dedicated lithic assemblage
- Mostly basalt pebbles collected from the beach and fragments thereof
- Scars, fractures and pitted surfaces indicate use as hammerstones
- Flakes and shatter chipped off during such use
- Significant breaks and openings on the large marine shells correspond with the stone tools
- Thick and massive shells require solid and tough rocks to open them up. Local limestone was not suitable.
- Primitive tools (“Mode 0”) applied for modern behaviour – unchanged until today!

Modern hammerstone courtesy of Rey Deyta

Shell Technology of Ilin Island

Tridacna

Several shell flakes were recovered in Bubog 1 and Bubog 2.

Bubog 2: Trench 2, Layer 4, 5, 7 and 10
Trench 3, Layer 5 and 8

Bubog 1: Layer 4, Layer 8

Flaked *Geloina coaxans* fragments found in Bubog 1 Layer 9

Direct radiocarbon dates between 28,000-32,000 cal. BP

Geloina coaxans

Geloina coaxans

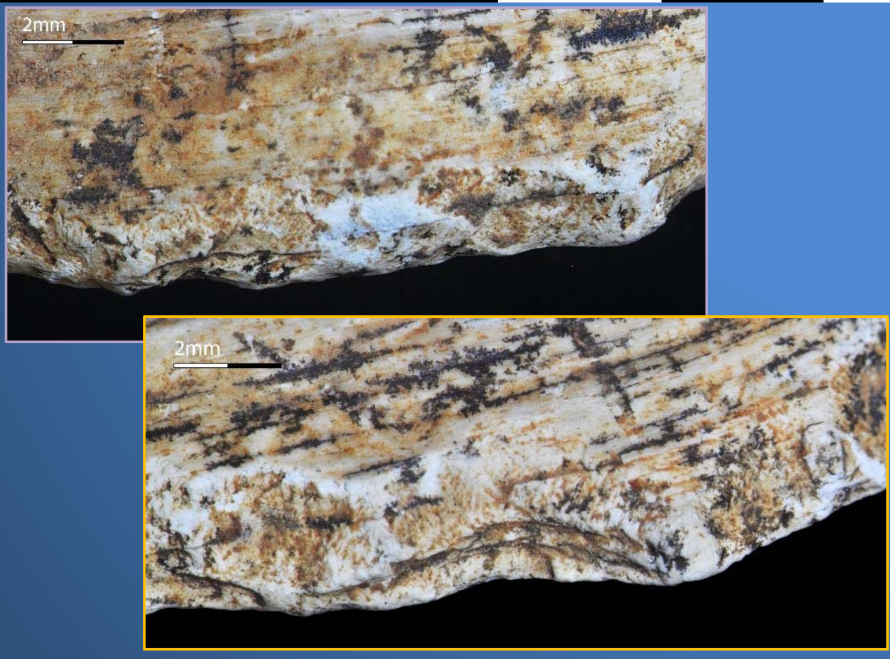
Shell Technology in Mindoro

Surprisingly little debate on shells, their potential as raw material is mostly neglected

Shell as raw material readily available at coastal areas in SE-Asia and Island SE-Asia

Flaked *Geloina coaxans* fragments found in Bubog 1 Layer 9

Shell Technology of Ilin Island



Flaked shell fragments with denticulated edge wear pattern. Layer 9a, *c.* 28-31ka cal. BP

Shell Technology of Ilin Island

Experimental
Archaeological

Recurring pattern: Longitudinal and transverse fracturing of the Geloina shells.
Battering marks on the umbo

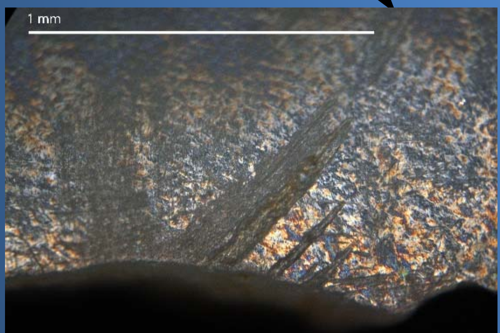
Example: Splitting bamboo

Shell Technology of Ilin Island

Experimentation and functional analysis


Collection of shell exposed to environmental and anthropological processes such as trampling, fire, weather and mechanical opening of the shell.

Reproduction of flaked shell tools

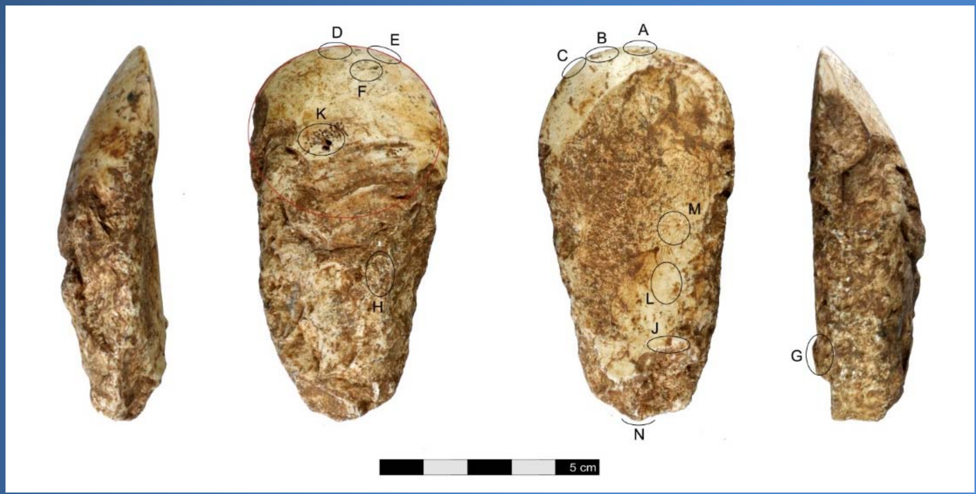


Documentation of the ocurring macro and micro wear patterns of shell fracturing



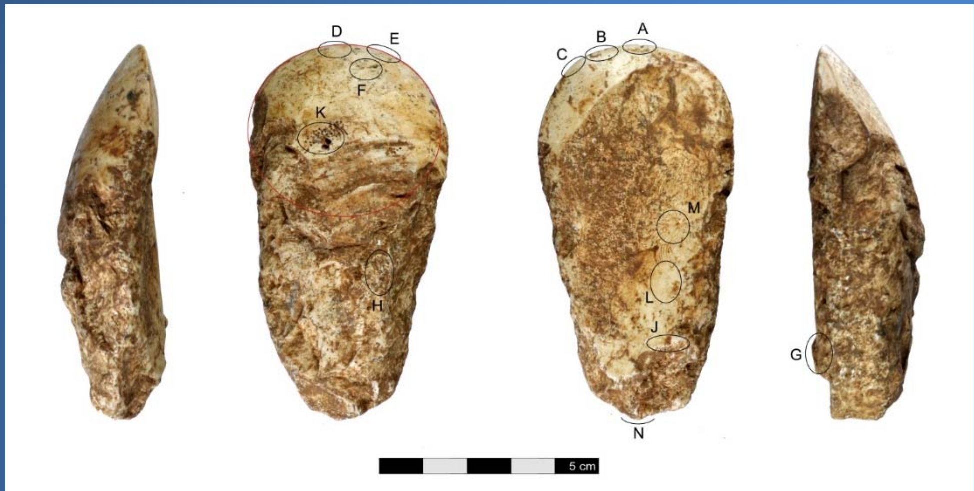
Experimental use on hard, soft and fibrous contact materials

A Shell Adze from Ilin Island



Edge-ground shell adze made of giant clam (*Tridacna gigas)*
in Layer 8 of Bubog 1. Direct ^{14}C date produced an age of 7550 – 7250 cal. BP.
Earliest securely dated shell adze in the Philippines and one of the oldest in ISEA.
Similar shell adze found in Bilat Cave across Ilin Channel in close distance to Bubog.
A direct ^{14}C date of 7414-7285 cal. BP matches the Bubog 1 adze.
Evidence for a local production of shell adzes:
Preform found in 2016 at Bubog 2.
Just returned a direct AMS dating: 9115-8899 cal. BP

A Shell Adze from Ilin Island



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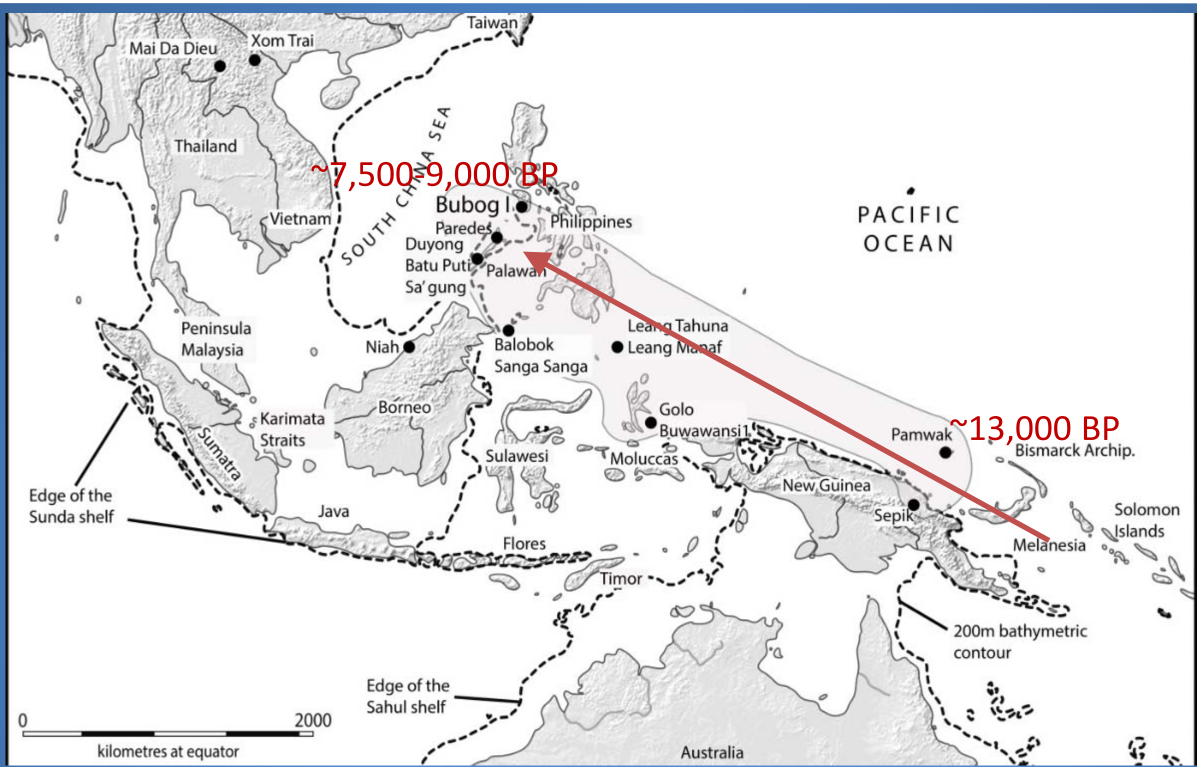
Evidence for local production:

Preform found in 2016 at Bubog 2, Trench 3

Direct AMS ^{14}C date of 9115-8899 cal. BP

Shell Technology in ISEA and Melanesia



Pawlik et al. 2015

Shell adzes cannot be a local variant of ground stone adzes that are only recorded in the later Holocene, and possibly introduced from Mainland Southeast Asia after ca. 4000 cal BP.

The oldest shell adzes appear in Bismarck Archipelago, suggesting local innovation in Island Melanesia and contacts between eastern Indonesia, the Philippines and Near Oceania.

The geographic distribution of archaeological sites with ground Tridacna shell adzes since the Terminal Pleistocene across Island Southeast Asia and Melanesia lies along the expansion route of Austronesians and the Lapita Culture several thousand years later.

Contacts might have already existed during the Early Holocene, long before the Austronesian expansion.

Prehistoric Technology in ISEA

- Very limited formality and high expediency of lithic assemblages
- Artefactual evidence for the use of shells for tool production (unlike wood and bamboo).
- Flaked shell tools are even dominant compared to lithic flakes in Bubog
- No chert sources on Ilin Island while shells are abundant
- Grinding and flaking were applied for tool production
- Igneous pebbles and shell tools complement but also might have replaced chert flake tools, at least for some activities.
- Solid structure and hardness of several marine bivalve species allow heavy duty uses, e.g. as chisels and adzes for woodworking
- Edge-ground shell adzes were a technological innovation in ISEA and the West-Pacific region
- Human adaptive capacities and versatility of those early islanders provided alternatives to formal toolkits

Connecting Islands: Maritime Interaction

Before the shell midden (>30,000 years ago)

Late Pleistocene layers with a dominantly terrestrial fauna, incl. endemic pig, tamaraw, rodents and lizards

Assemblage still contains various fish remains

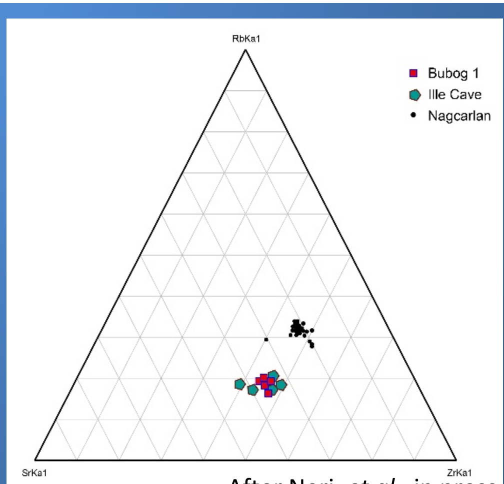
Flaked stone tools, no pebble hammers and shell artefacts

Several Obsidian flakes found in Layer 10, from ca. 20 and 50cm below the shell midden. Also in the lowest shell midden layer (Layer 9)

PXRF spectrometry (by Christian Reepmeyer): elemental signatures match ca. 9-11ky old obsidian artefacts from Ille Cave, N-Palawan

Exploitation of a shared, yet unknown source

Perhaps located in the now submerged region of the archipelago?



After Neri, *et al.*, in press

Connecting Islands: Maritime Interaction

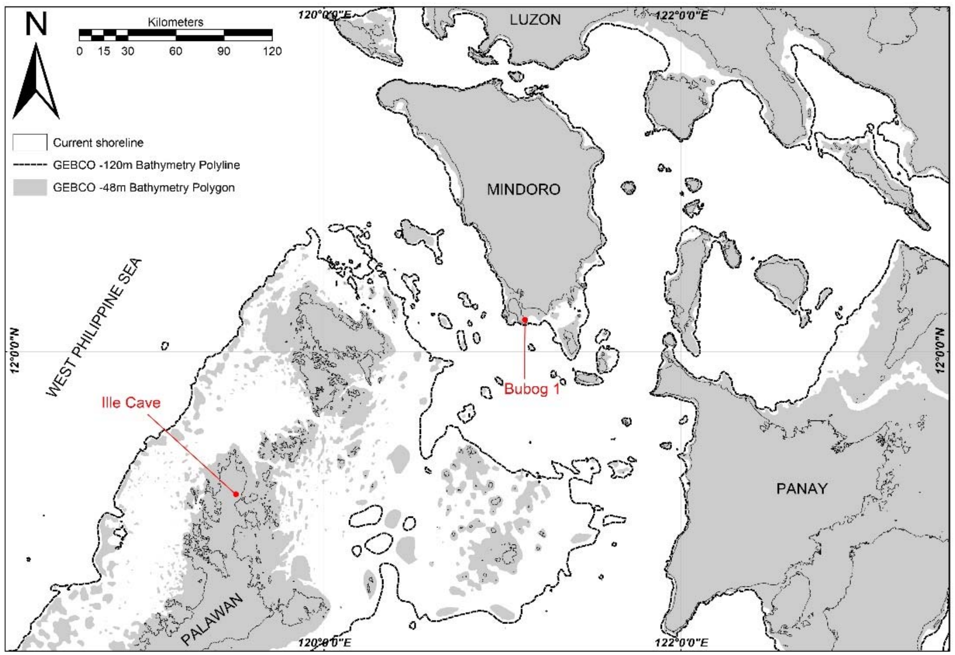
Obsidians give evidence of a cultural link between those islands

Straight distance between Ille Cave and Bubog ca. 210km

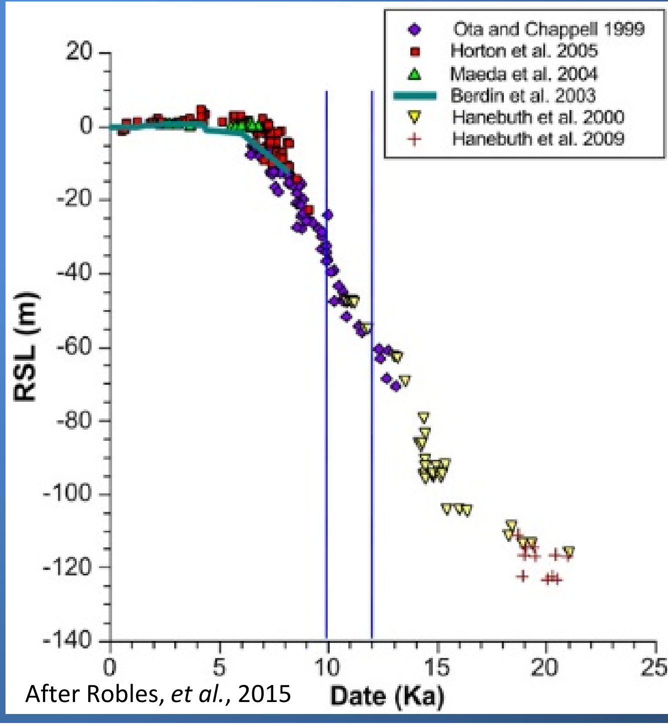
Distance over open water from a greater Palawan incl. Busuanga/Coron islands to Ilin Island ~60km at ca. 11ka BP

Ille Cave ~25km inland at that time, Bubog remained coastal

Remains of pelagic fishes and fishing hooks made of polished bone at Bubog support the practice of open-sea faring.



Reepmeyer 2015



After Robles, *et al.*, 2015

Archaeological Research in Mindoro – continues:

Fieldwork and Laboratory analysis of:

Shells and shell artefacts

Fish remains

Use-wear analysis

Microvertebrate remains

Macro- and microbotanical remains

Sedimentological and geochemical analysis

Flexed human burial from Bubog 1

We expect further data on:

The occupation and peopling of Mindoro Island in the Upper Pleistocene

Subsistence strategies and the advancement of behaviour

The diversification of material culture and technology of those early islanders as a response to this special ecosystem.

Linking the palaeo-biogeographic regions of Sundaland and Palawan and the isolated islands of the main Philippine archipelago and trace back the migration paths of the first Filipinos.


Thank you!
Education and Culture
Erasmus Mundus
NATIONAL GEOGRAPHIC SOCIETY
INCORPORATED A.D. 1888
UNIVERSITY OF THE PHILIPPINES
1908
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