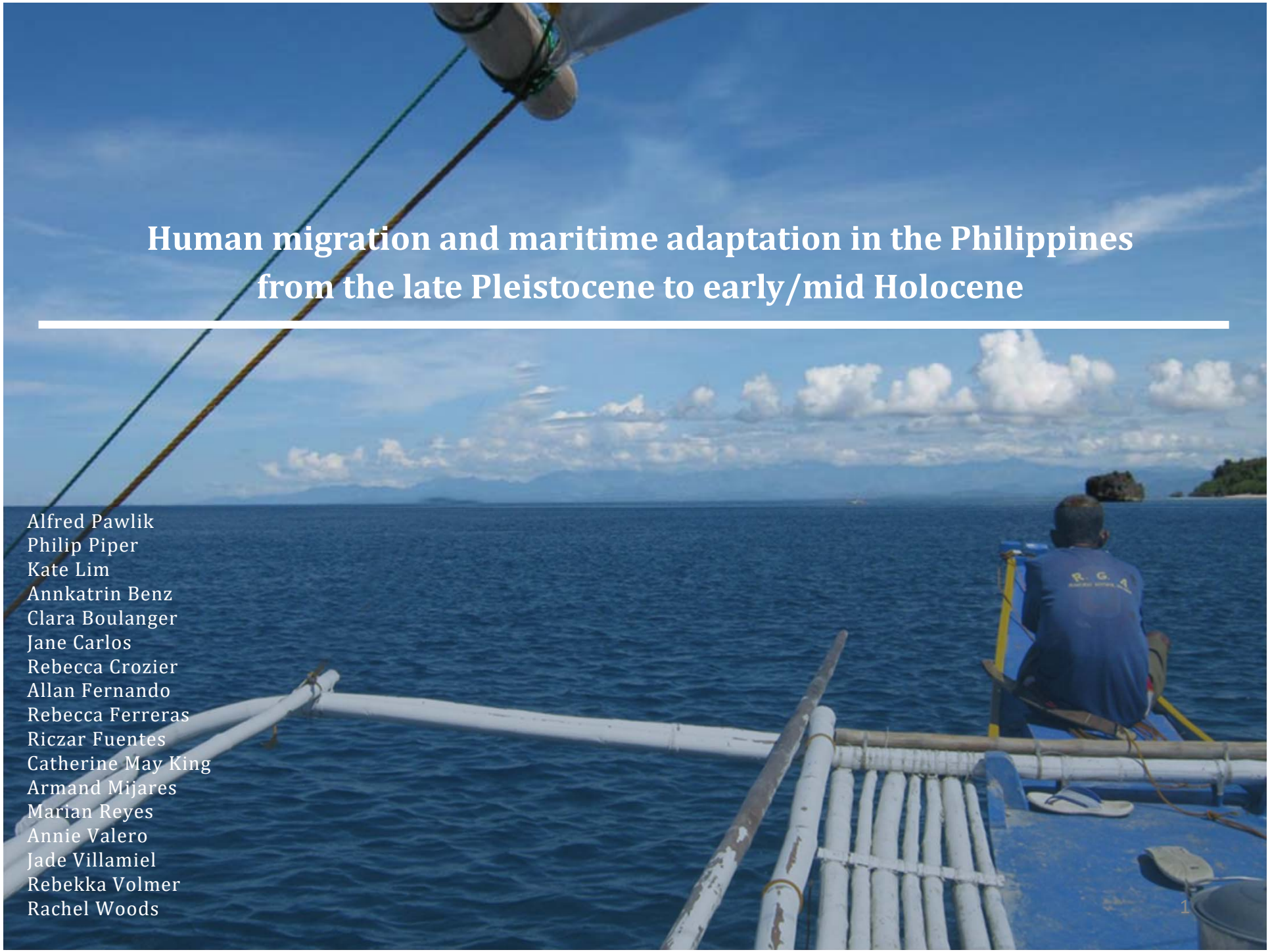


Human migration and maritime adaptation in the Philippines from the late Pleistocene to early/mid Holocene

Alfred Pawlik
Philip Piper
Kate Lim
Annkatrin Benz
Clara Boulanger
Jane Carlos
Rebecca Crozier
Allan Fernando
Rebecca Ferreras
Riczar Fuentes
Catherine May King
Armand Mijares
Marian Reyes
Annie Valero
Jade Villamiel
Rebekka Volmer
Rachel Woods

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 Southeast Asia.

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

Early Peopling of the Philippine Archipelago

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

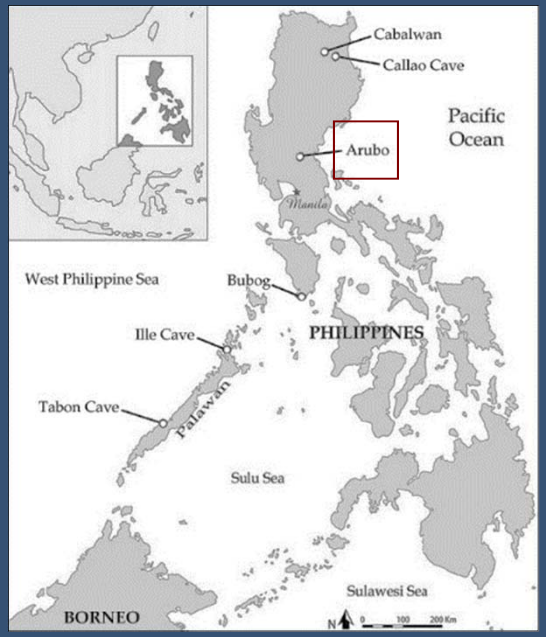
Tabon Cave, Palawan: Upper Palaeolithic assemblages and human fossil remains dated to up to *c*. 35-50ky BP.

Fox 1970; Détroit et al. 2004

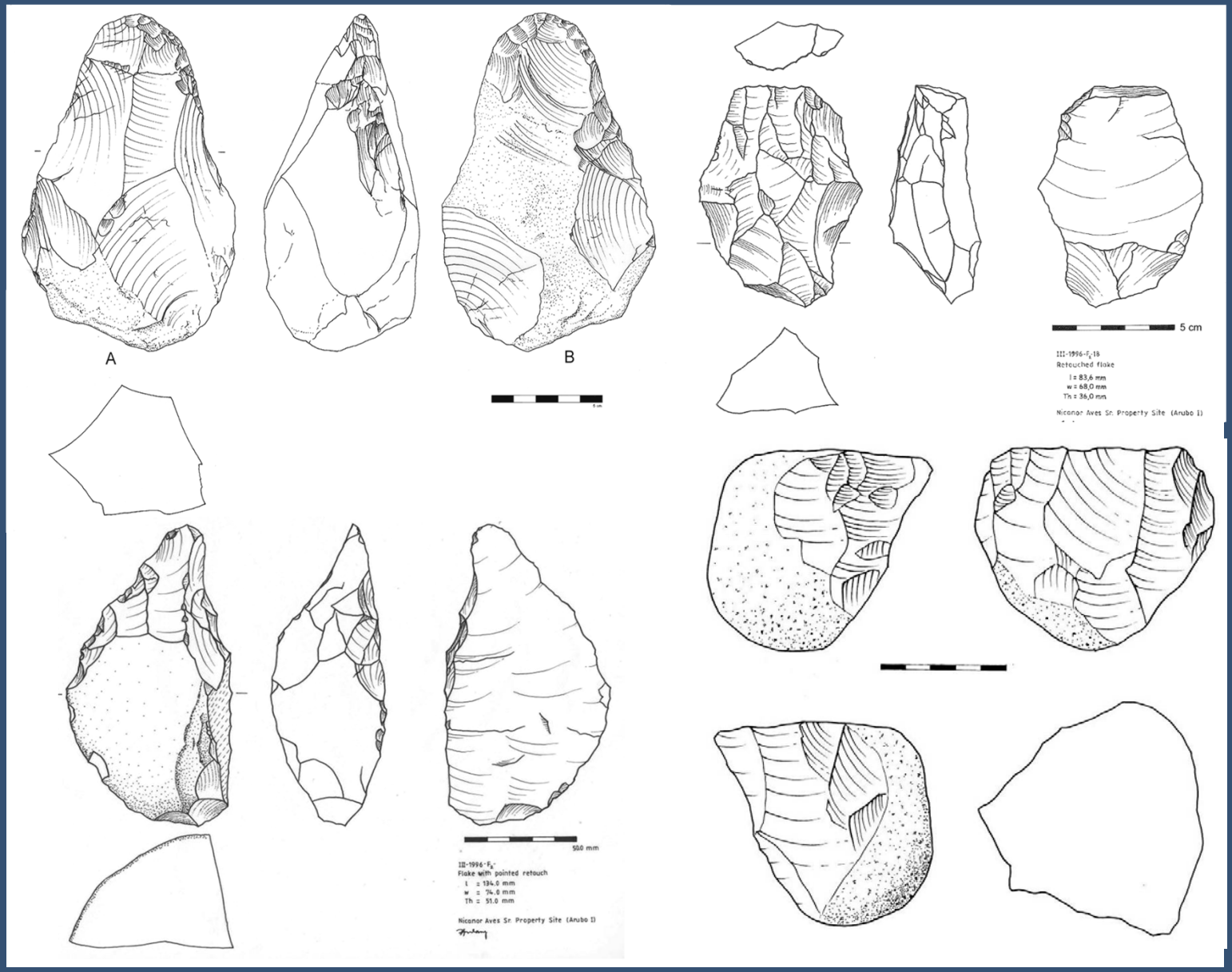
Callao Cave, Peñablanca, northern Luzon: Discovery of a human 3rd metatarsal and several teeth dated to *c*. 67-50ky BP.

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

Early Palaeolithic on the Surface?



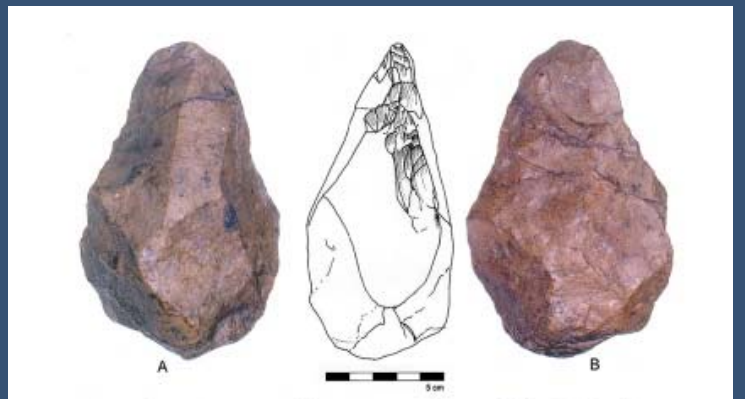
Early Palaeolithic



Early Palaeolithic

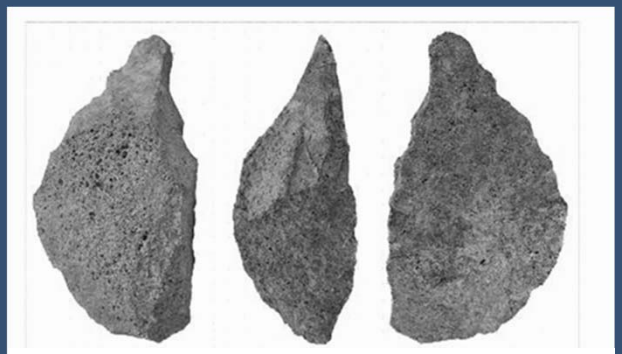
Although no direct dating is available, morphological and technological similarity with lithic artefacts from lower Palaeolithic sites in SE-Asia suggest a similar age:

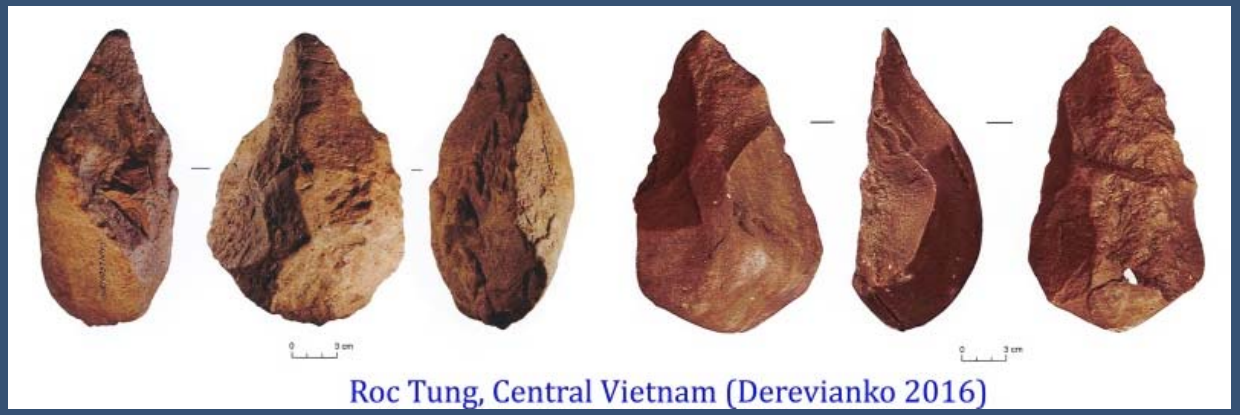
- South China, e.g. Bose Basin (0.8ma BP)
- Thailand, e.g. Lampang (E/MPL)
- Central Vietnam, e.g. Roc Tung (0.7-0.9ma BP)
- Indonesia, e.g. Sangiran (>1ma BP) and
- Soa Basin sites on Flores Island (0.8-1ma BP)



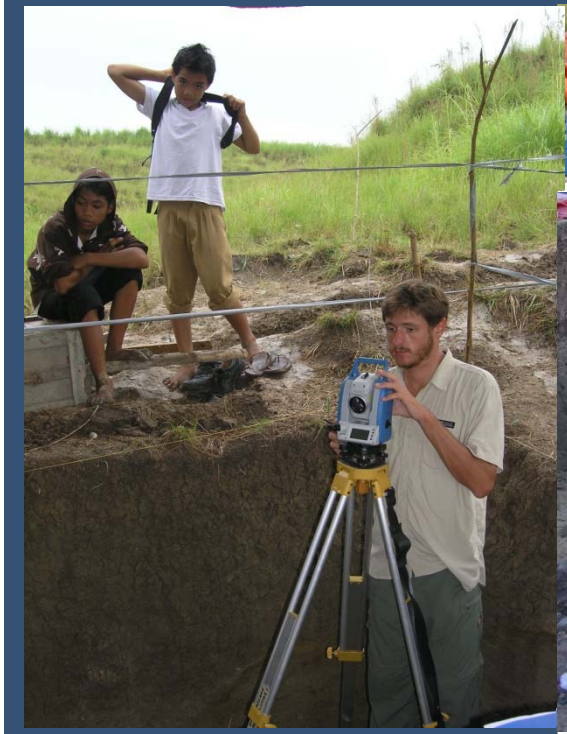
Arubo, Central Luzon (Pawlik 2002)

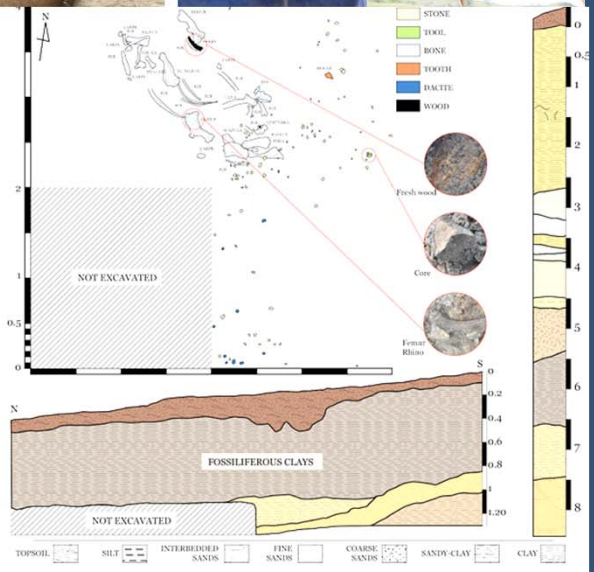

Fengshudao, Bose Basin (Wang et al. 2014)


Arubo, Central Luzon (Pawlik 2002)


Roc Tung, Central Vietnam (Derevianko 2016)

Pleistocene Megafauna in Northern Luzon



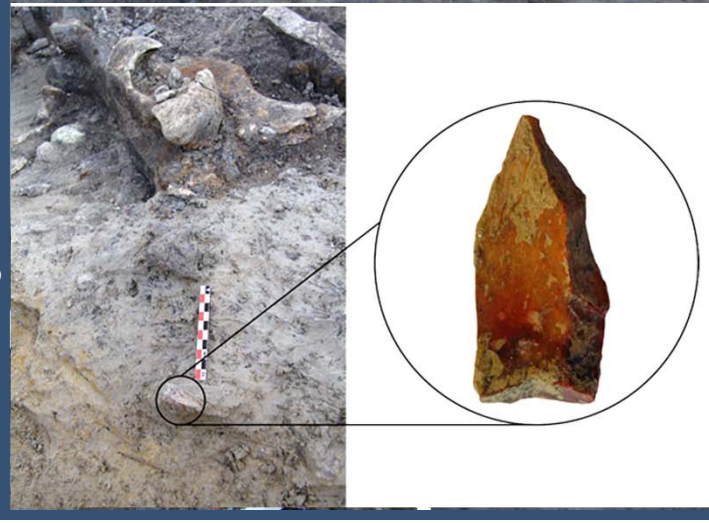


Espinosa, Kalinga: Recent excavations (Th. Ingicco) revealed a rhinoceros skeleton in context.

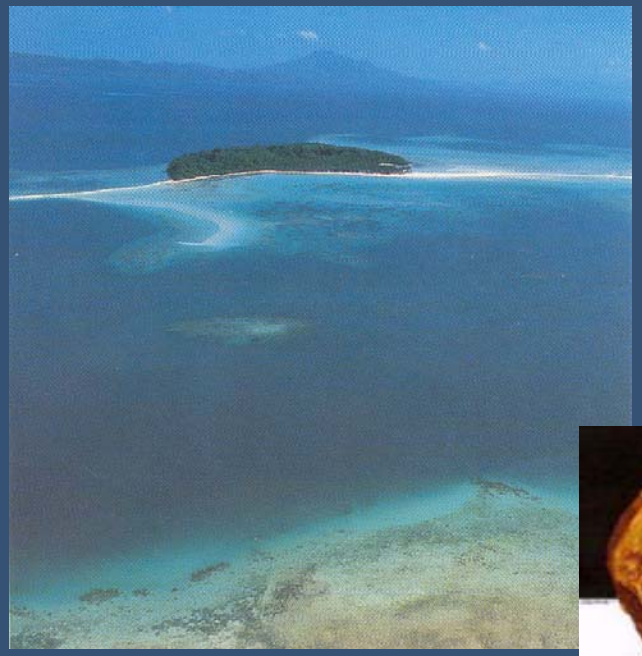
ESR, Ar/Ar: c. 0.6 – 1.0ma BP

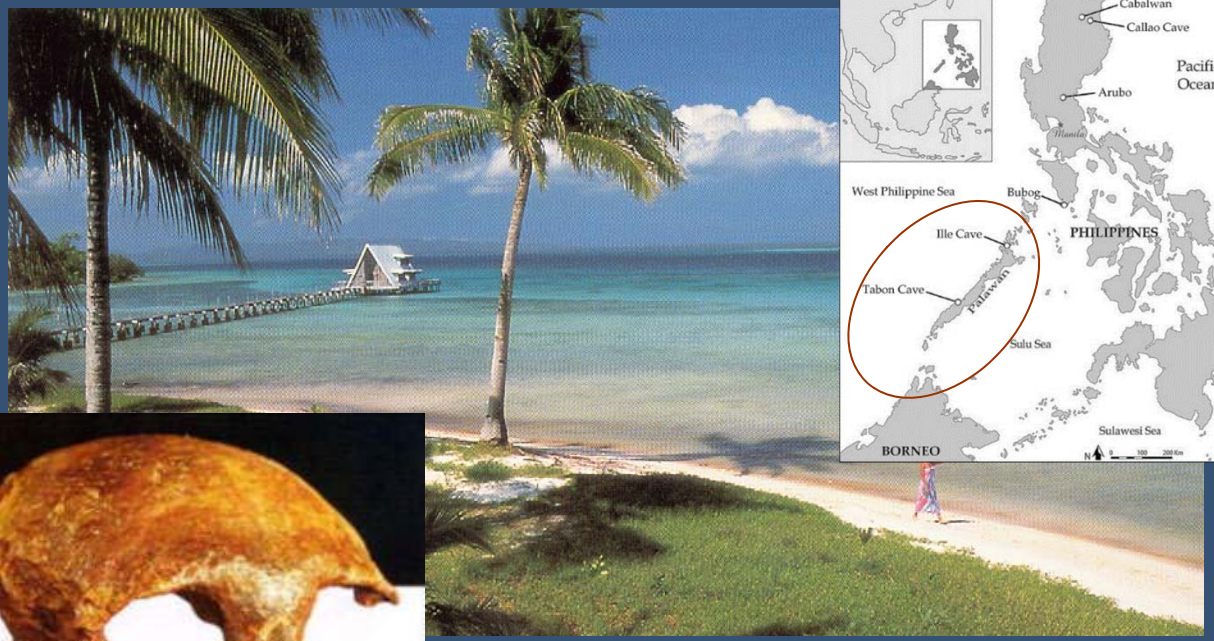
Butchering marks?

Associated with stone tools?



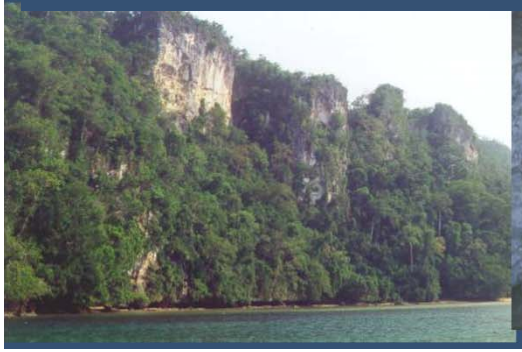
Palawan Island: Entry point of Homo sapiens?

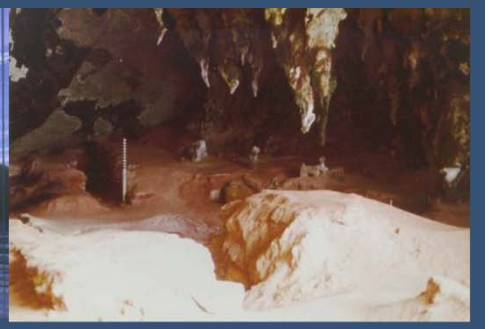




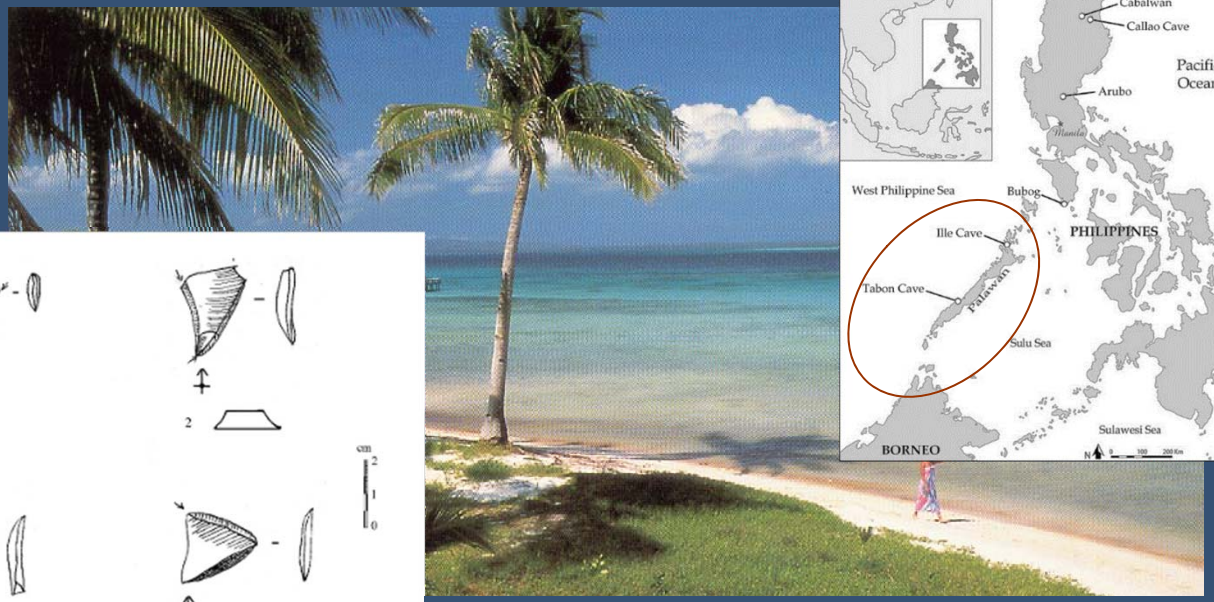
Tabon Caves (Fox 1970)

'Tabon Man': Remains of several individuals of ***H. sapiens***: Skull cap, mandible, femur bones. Dated to between 14,500 and 50,000 BP (^{14}C and U-series)





Palawan Island: Entry point of Homo sapiens?



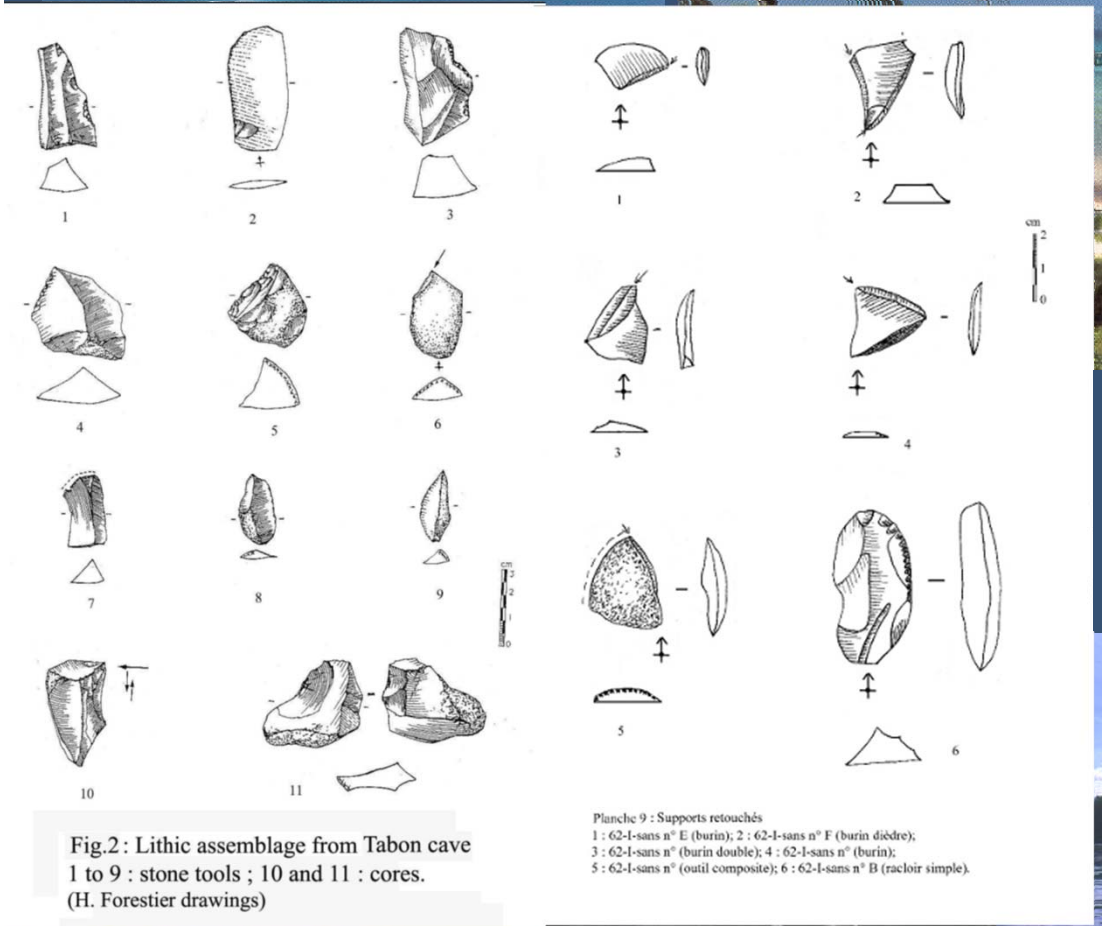
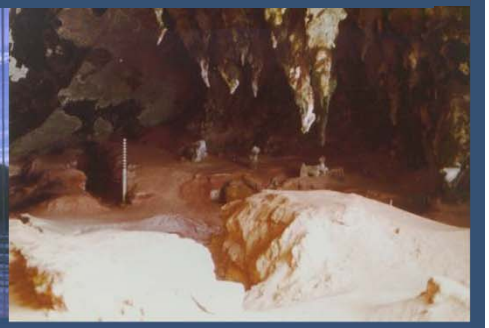


Fig.2 : Lithic assemblage from Tabon cave
1 to 9 : stone tools ; 10 and 11 : cores.
(H. Forestier drawings)

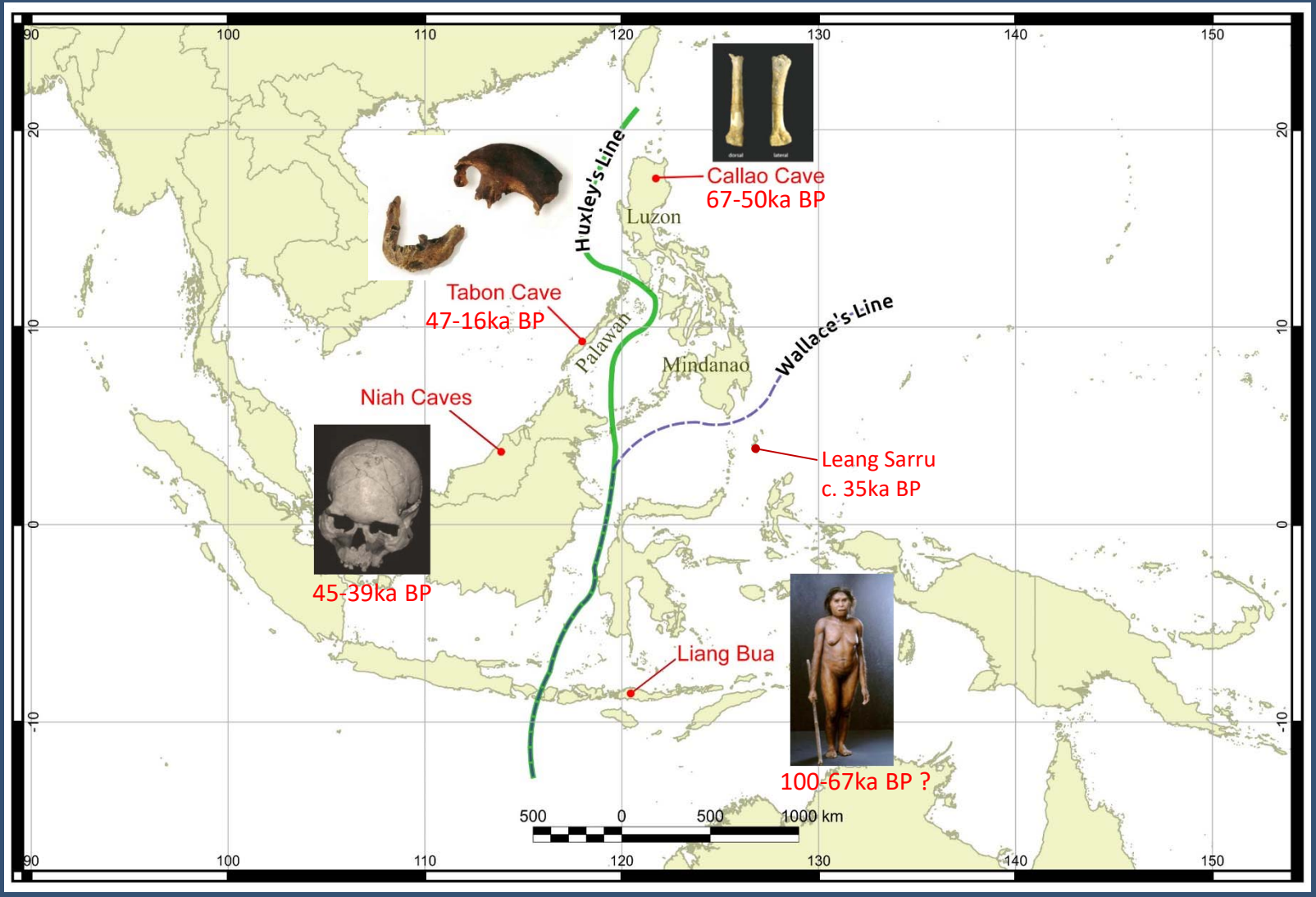
Planche 9 : Supports retouchés
1 : 62-I-sans n° E (burin); 2 : 62-I-sans n° F (burin diédre);
3 : 62-I-sans n° (burin double); 4 : 62-I-sans n° (burin);
5 : 62-I-sans n° (outil composite); 6 : 62-I-sans n° B (racloir simple).

'Tabonian':

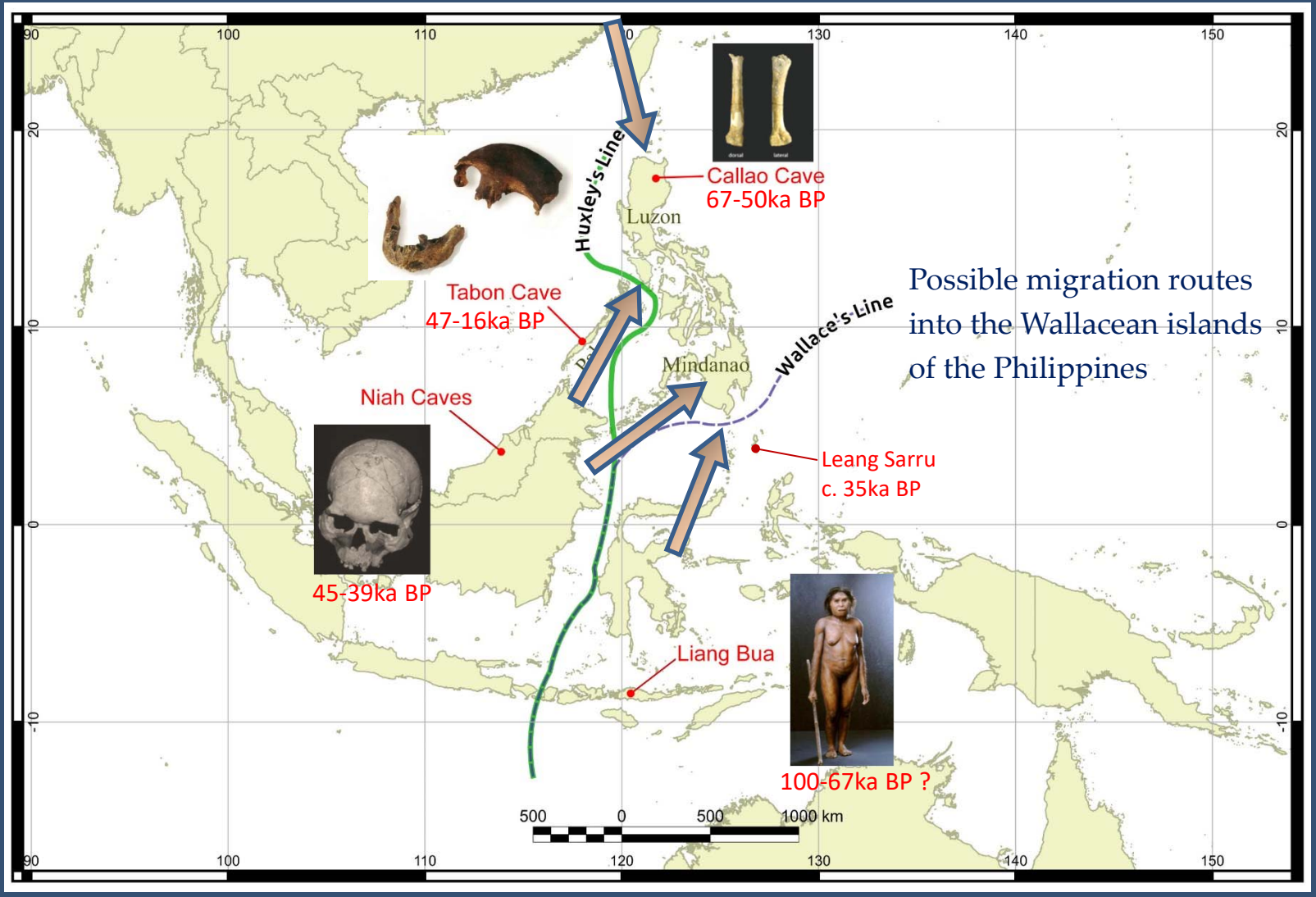
Simple flake assemblages. Technological continuity from Late Pleistocene until Mid-Holocene.



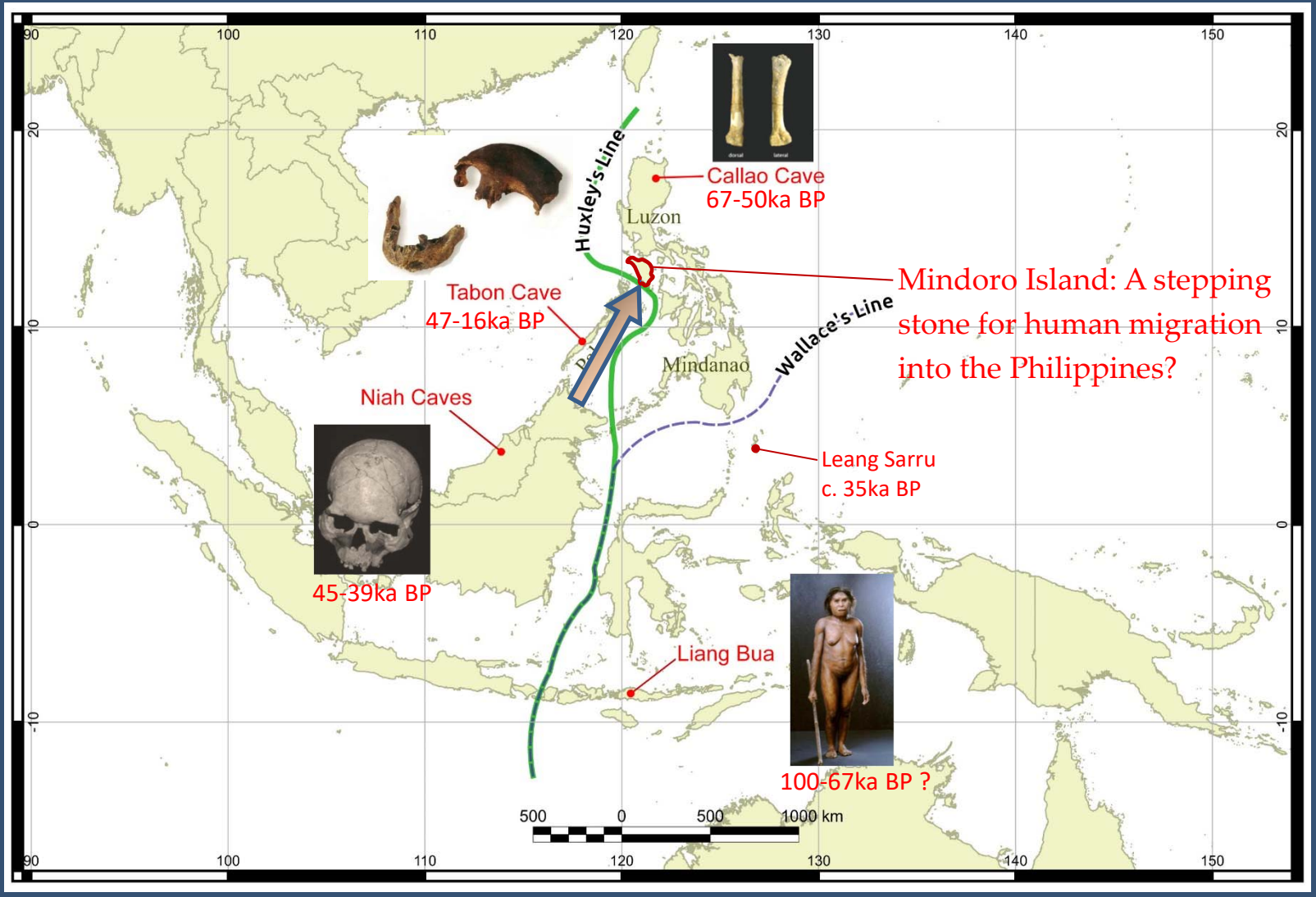
Early Peopling of the Philippine Archipelago



Early Peopling of the Philippine Archipelago



Early Peopling of the Philippine Archipelago



Archaeological Research in Mindoro

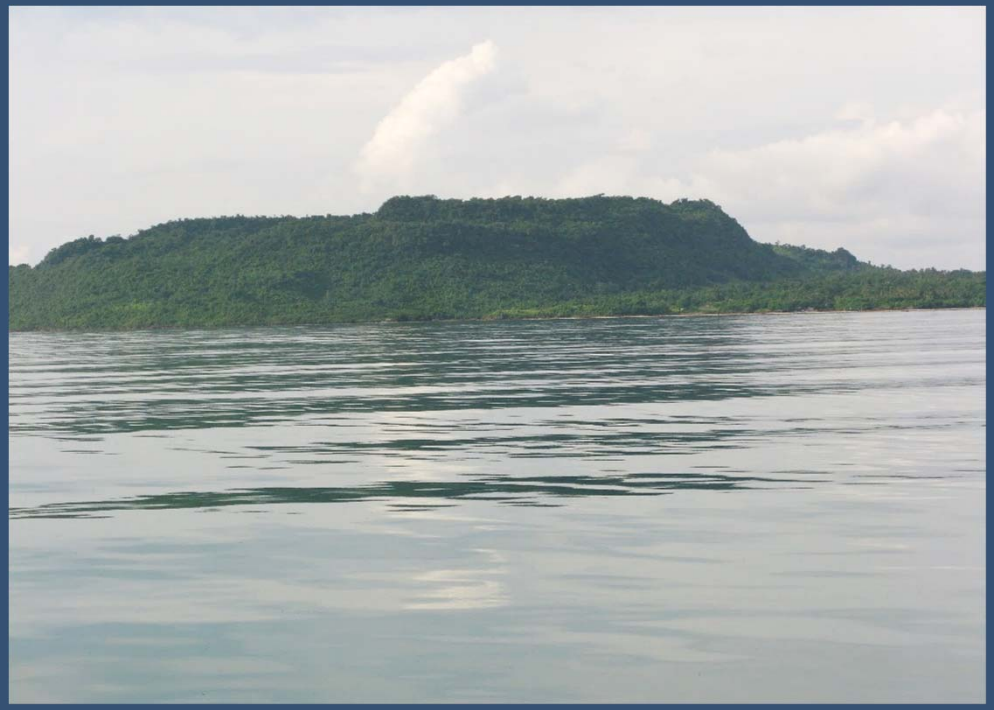
Surveys and excavations in Mindoro since 2010

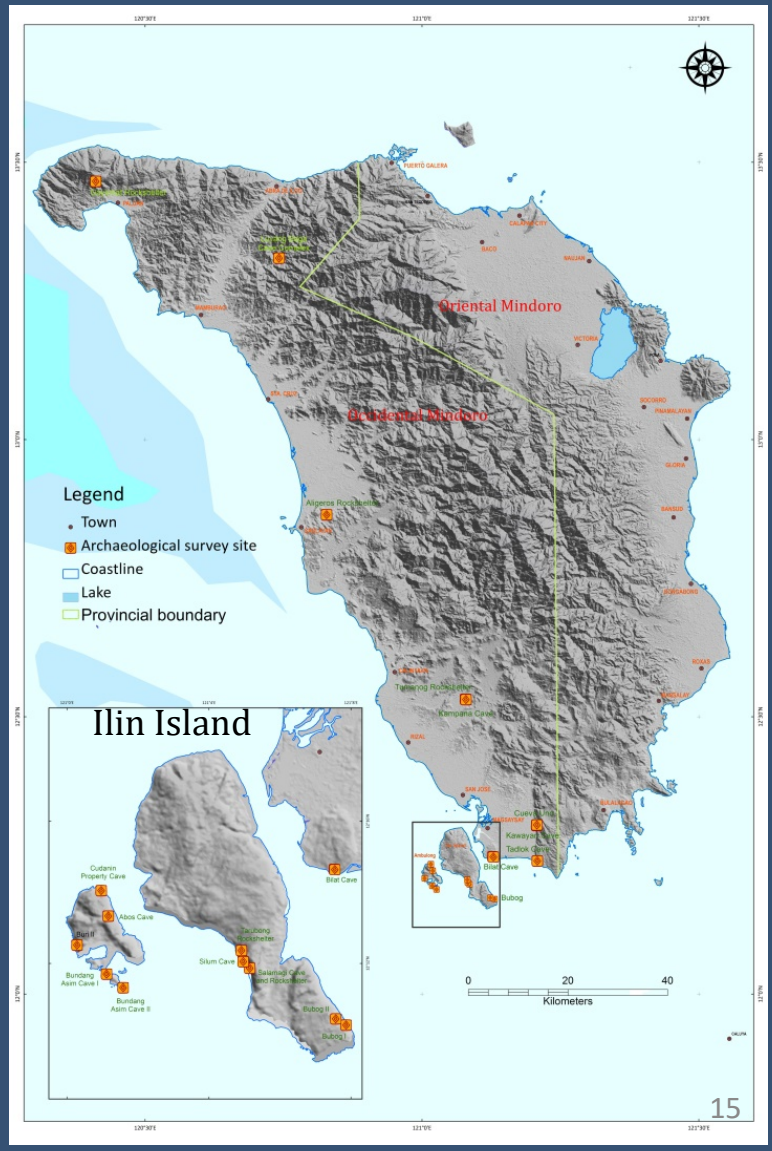
More than 40 sites have been found and surveyed on Mindoro since 2010

Archaeological Research in Mindoro

The limestone formations at the southern tip of Mindoro and the island of Ilin are the main surveying area

Ilin Island and Mindoro are today separated by a 900-1300 m wide channel but were connected until c. 10,000 years ago.





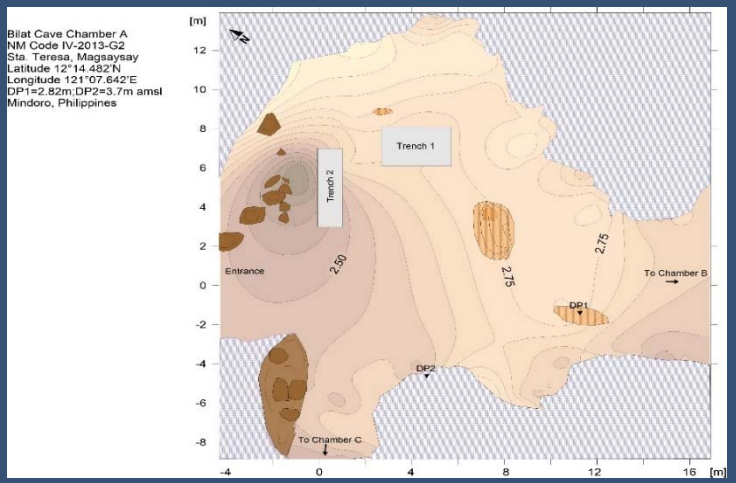
Archaeological Research in Mindoro

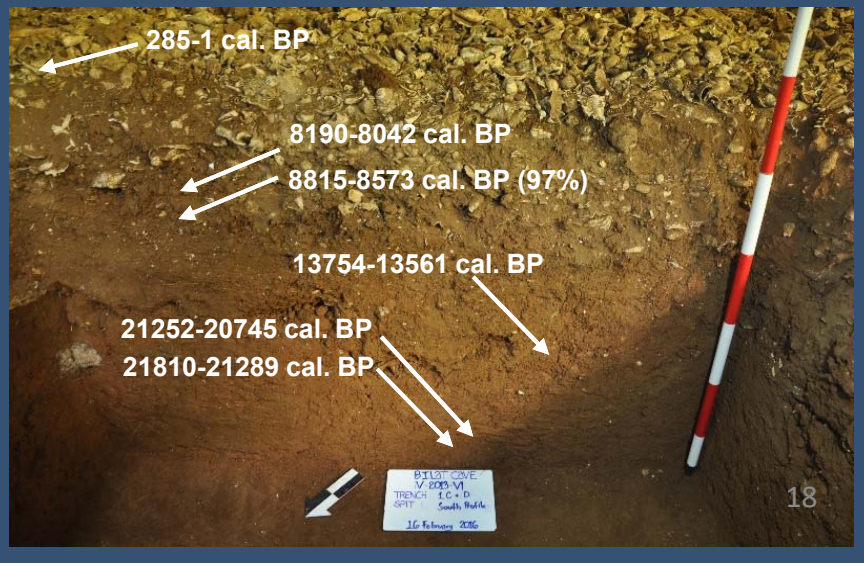
Archaeological Research in Mindoro

Archaeological Research in Mindoro – Santa Teresa

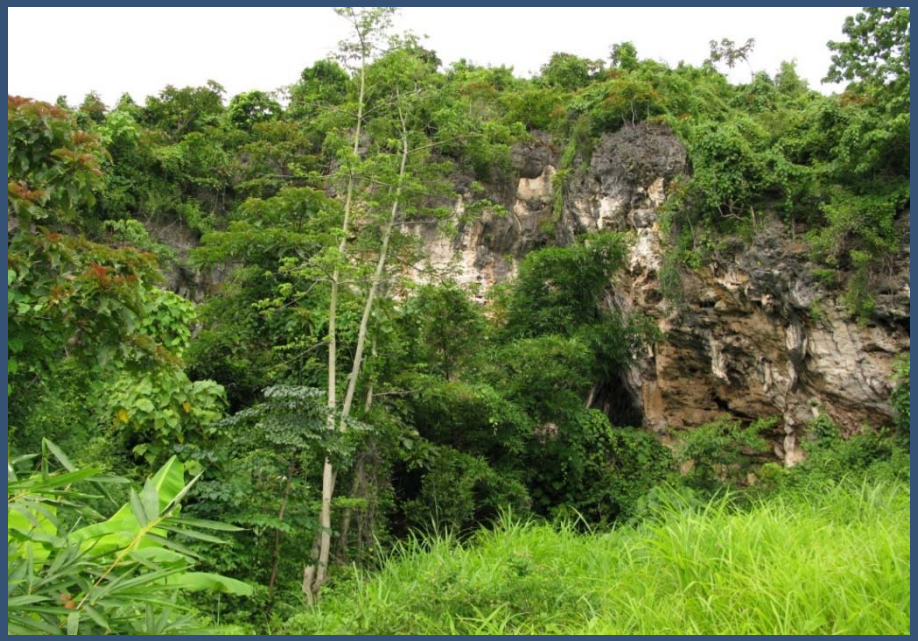
Bilat Cave

3 chambers open to land and sea side





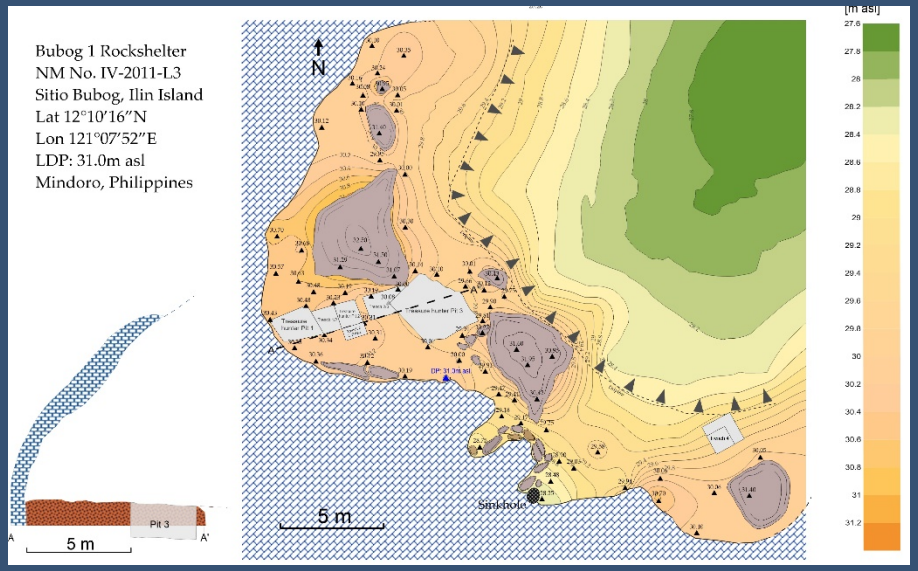
Archaeological Research in Mindoro – Ilin Island



BUBOG 1

Rockshelter and Cave

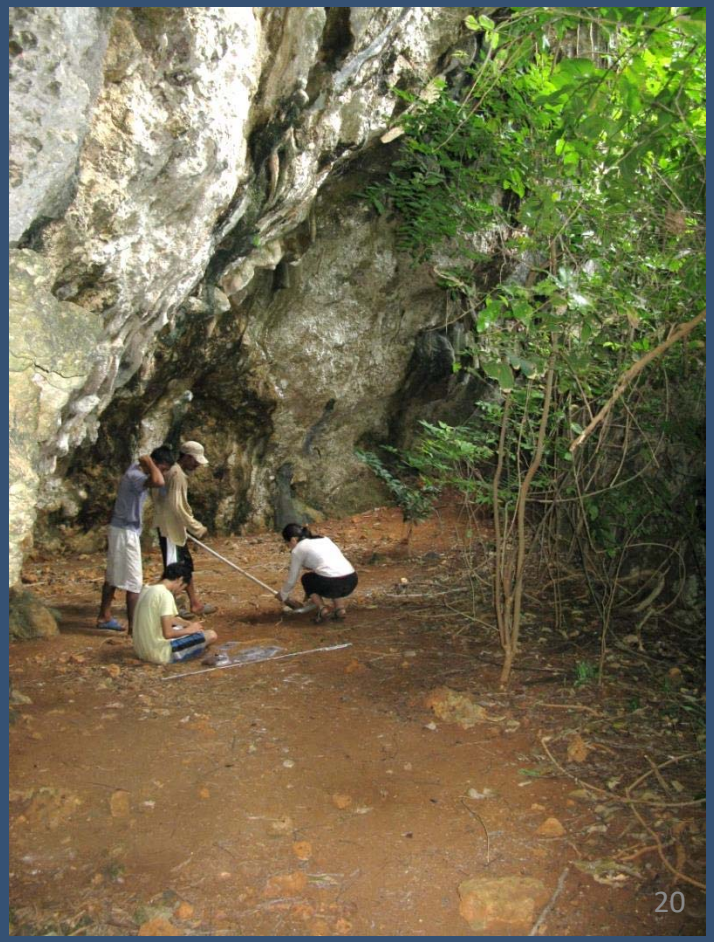
Large U-shaped habitation platform, separated into 3 sectors by rockfall

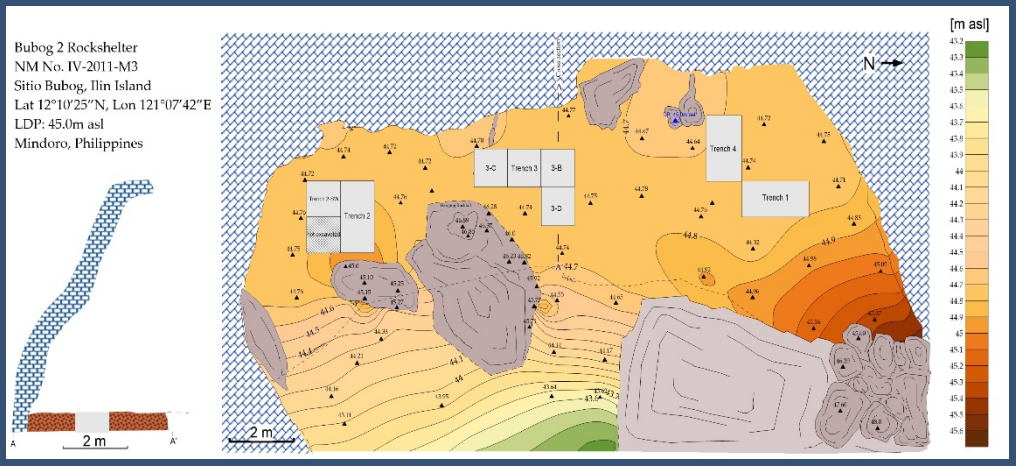


Archaeological Research in Mindoro – Ilin Island

BUBOG 2 Rockshelter

Rectangular habitation platform protected by rockfall from the seaside





Archaeological Research in Mindoro – Ilin Island

Bubog 2

Hearths and pottery in the subsurface layer
Shell midden deposits underneath.
Consistent chronology from 15th century AD until *c.* 11,000 BP

Archaeological Research in Mindoro – Ilin Island

Bubog 1:

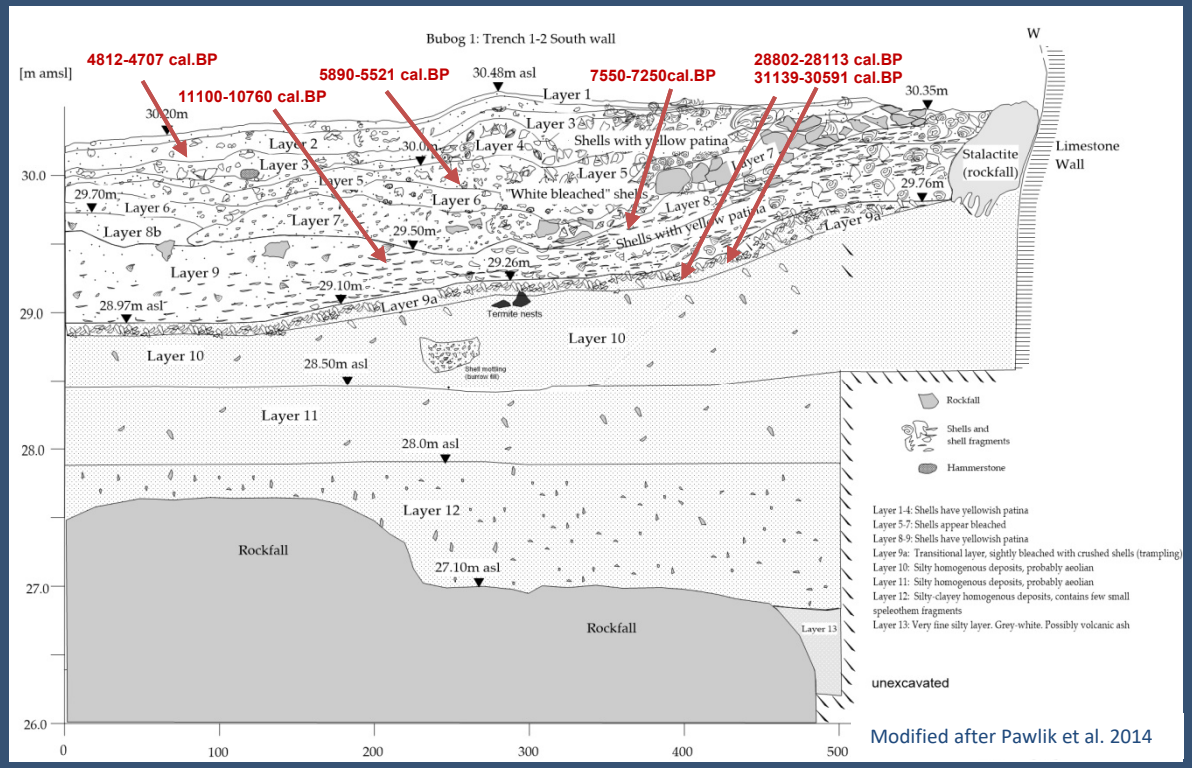
Shell deposits exposed by treasure hunters.

Stratified shell midden with 9 distinctive layers

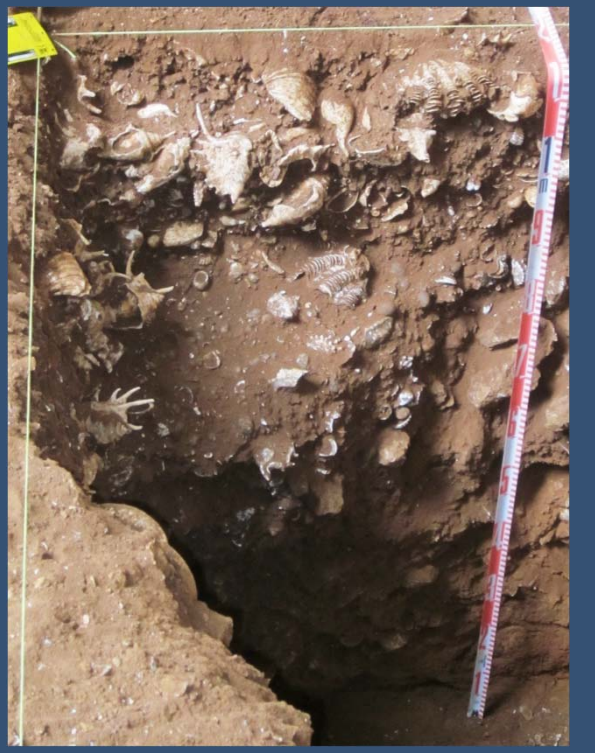
Stratified shell midden in Bubog 1, Ilin Island

^{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

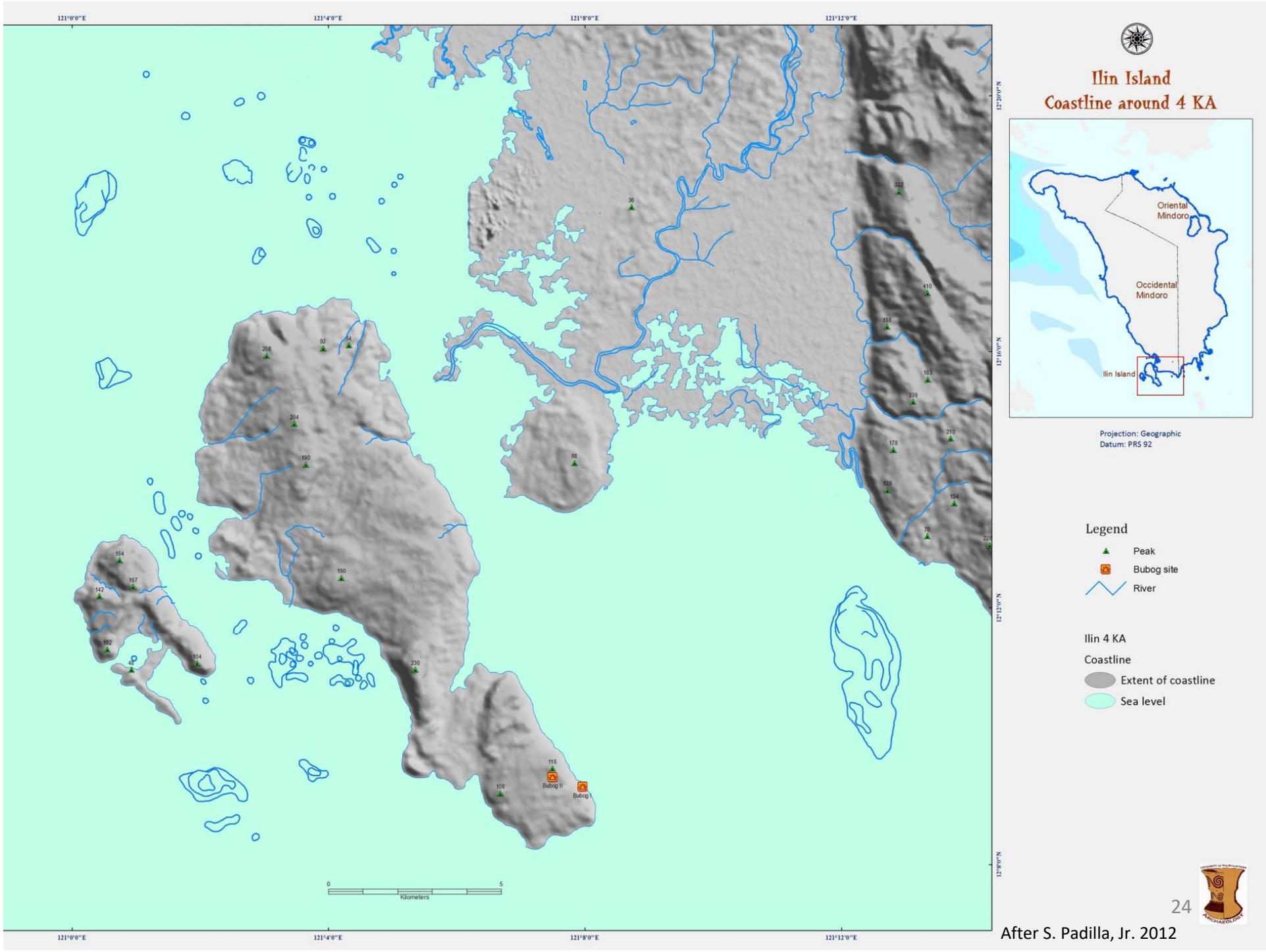


Modified after Pawlik et al. 2014

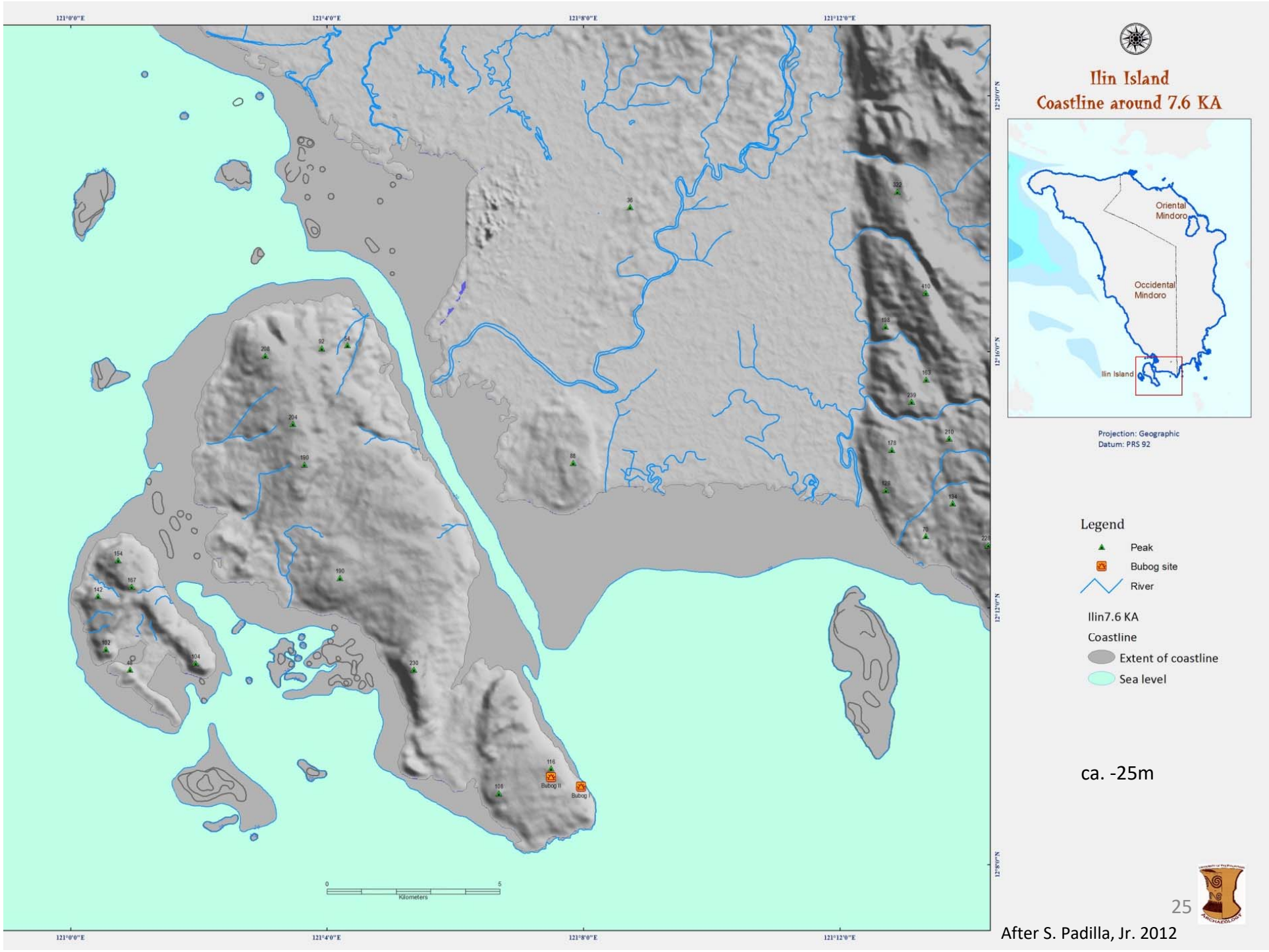


Shift from deeper dwelling marine sea shells (e.g. *Nautilus*) in the upper layers to dominantly mangrove dwellers (e.g. *Batissa sp.*) and estuarine shells (*Geloina coaxans*) in the lower layers of the shell midden:

Changes in Mollusca reflect sea level rise



After S. Padilla, Jr. 2012



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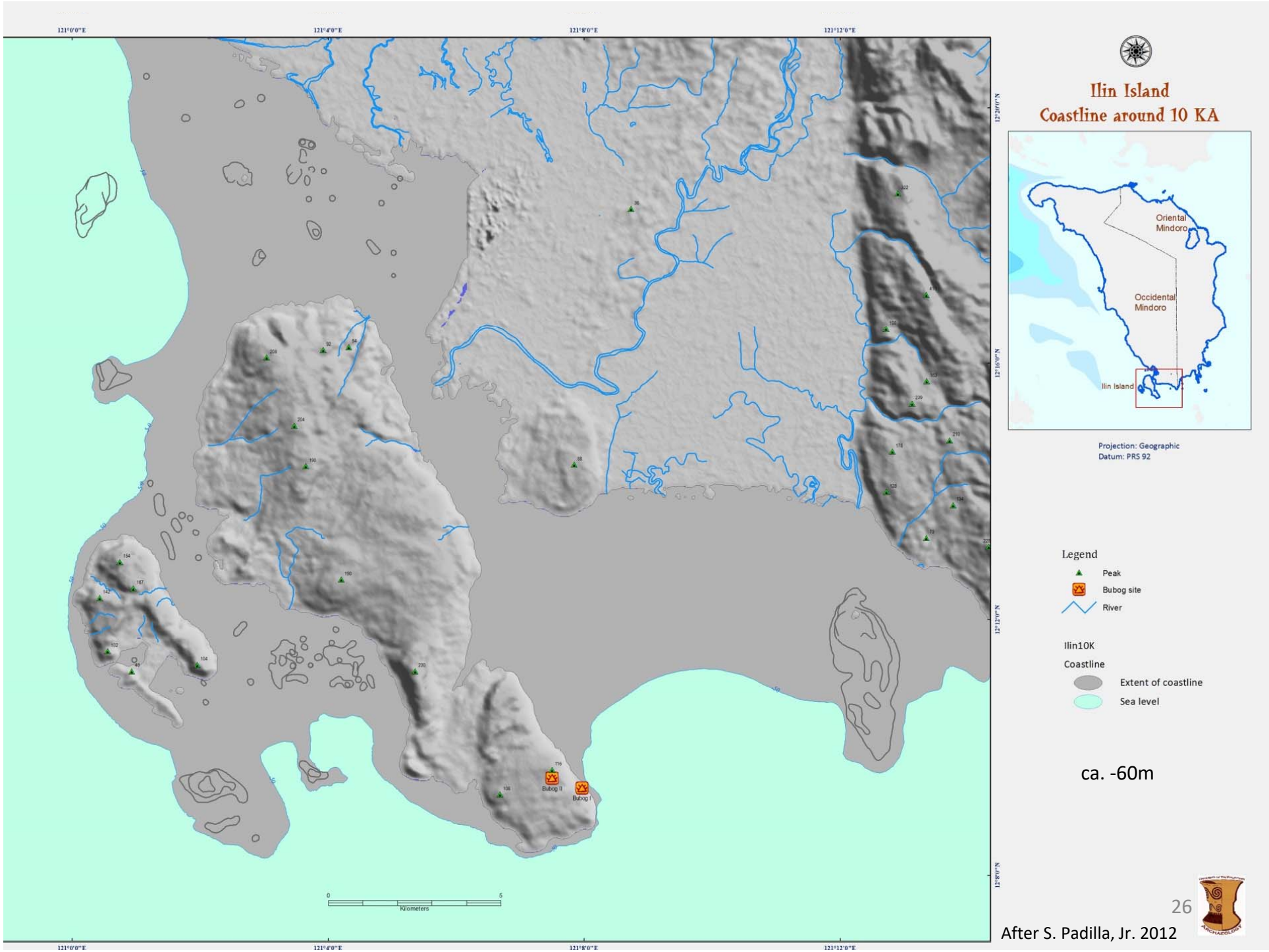

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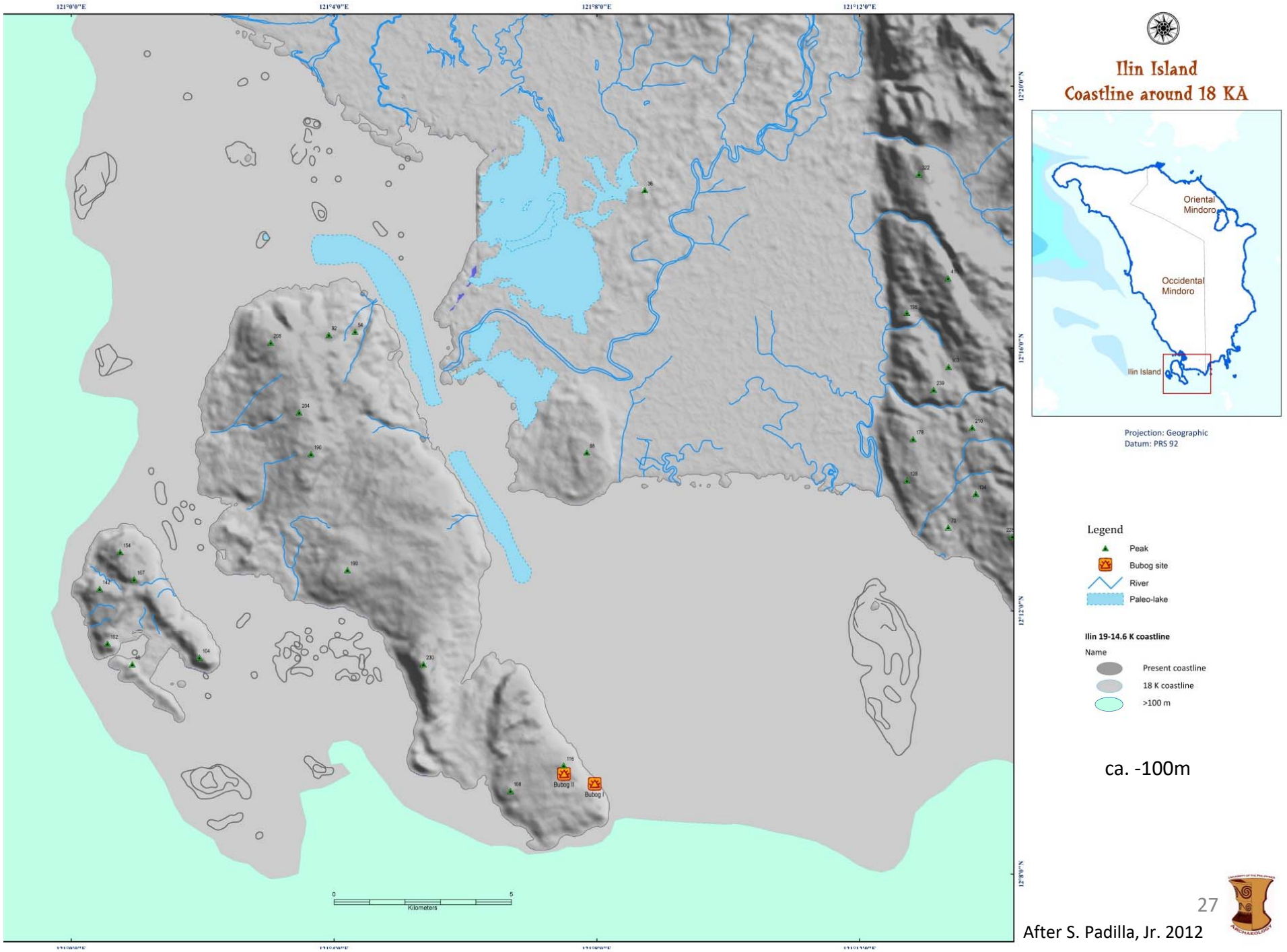


After S. Padilla, Jr. 2012

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

Marine Vertebrate Fauna of Ilin Island

Preliminary results on fish bones from Bubog I
(Clara Boulanger)

Coral reef fishes
(Layer 1 to layer 12)

⇒ Mangrove
⇒ Pelagic area


Balistidae


Nemipteridae


Diodontidae


Labridae


Ostraciidae


Lutjanidae


Muraenidae


Scaridae


Serranidae


Tetraodontidae


Sparidae


Acanthuridae

Inshore fishes
(Layer 8 to 12)


Scombridae


Large Serranidae

Marine Vertebrate Fauna of Ilin Island

Preliminary results on fish bones from Bubog I
(Clara Boulanger)

NRT = 1401, NISP = 384
Significant part of the diet!

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

Mostly coral reef fishes throughout the stratigraphy

Appearance of **pelagic fishes** in the lower layers

Capacity of sailing far from the coast ?

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

Tetraodontidae

Diodontidae

Marine Vertebrate Fauna of Ilin Island

Preliminary results on fish bones from Bubog I
(Clara Boulanger)

NRT = 1401, NISP = 384
Significant part of the diet!

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

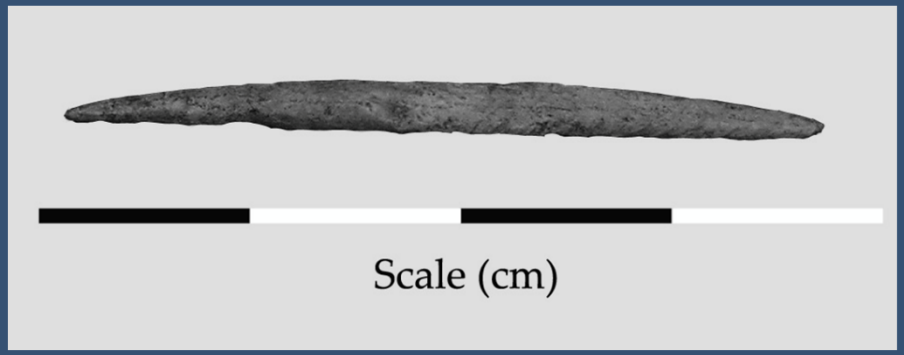
Mostly coral reef fishes throughout the stratigraphy

Appearance of **pelagic fishes** in the lower layers

Capacity of sailing far from the coast ?

Associated with early bone technology!

Bone artefact from Bubog 1, Layer 10 dating to >30ka BP. The oldest bone implement in the Philippines



Fishing gorge from Anaro 3, Batanes Islands dating to c. 2500 BP

Vertebrate Fauna of Ilin Island

Preliminary results on macromammals
(Philip Piper & Bea Ferreras)

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

No domestic pig

Burnt bones and cut marks

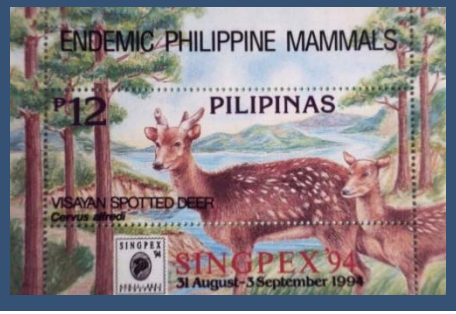
Animals possibly hunted on Mindoro then brought back to Ilin

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

Sus oliveri

Bubalus mindorensis (Tamaraw)

Rusa marianna



Cervus alfredi
(Philippine Spotted Deer)

Lithic tool use in Mindoro

Shell remains associated with basalt pebbles and their fragments

Scars, fractures and pitted surfaces indicate use as hammer

Significant breaks and openings on the large marine shells correspond with the stone hammers

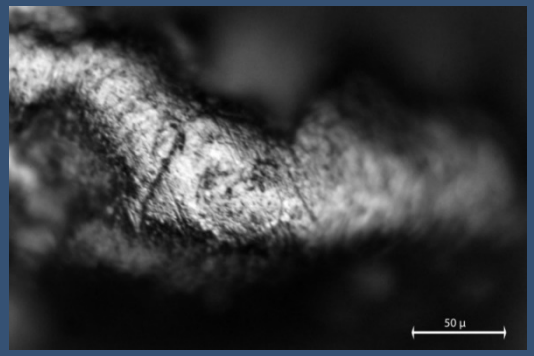
Modern hammerstone: courtesy of Rey Deyta

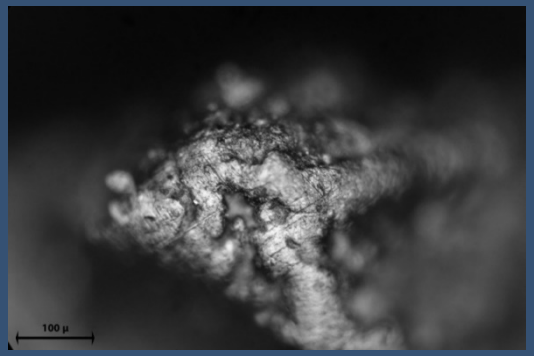
No intentionally flaked tools appear in the midden until Layer 9 where few small obsidian flakes were found

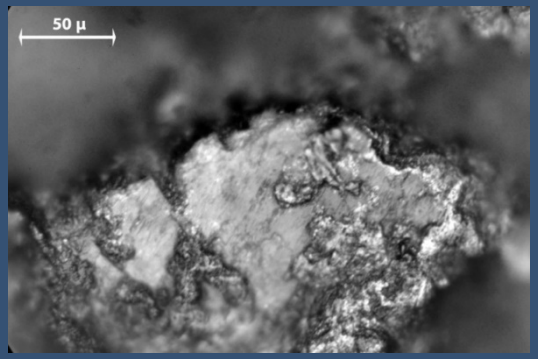
Fractures caused by impact

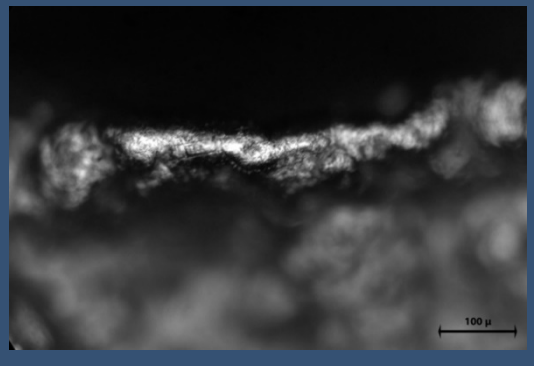
Lithic tool use in Mindoro

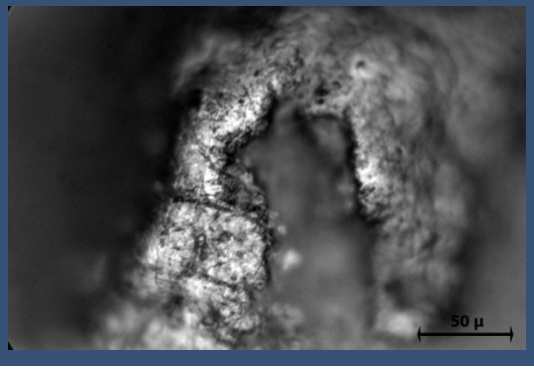
Instead: Pebble fragments with wear traces. Secondary use as '*ad hoc*' tools!

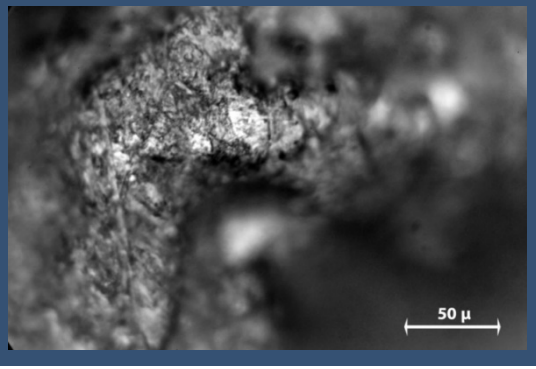








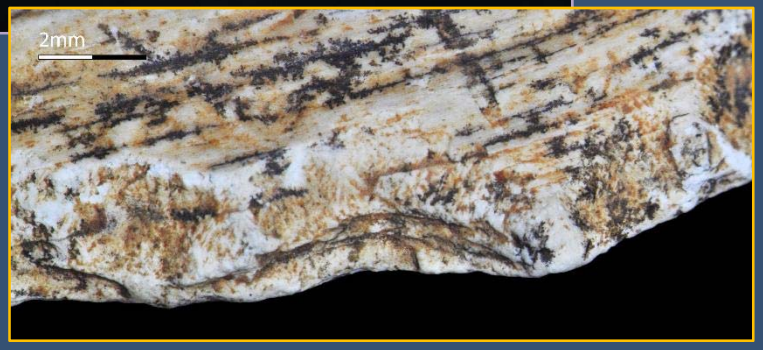




Shell Technology in Mindoro

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

Shell Technology of Ilin Island



Flaked shell fragments with worn and denticulated margins and other wear traces, *c.* 28-31ka BP

Shell Technology of Ilin Island

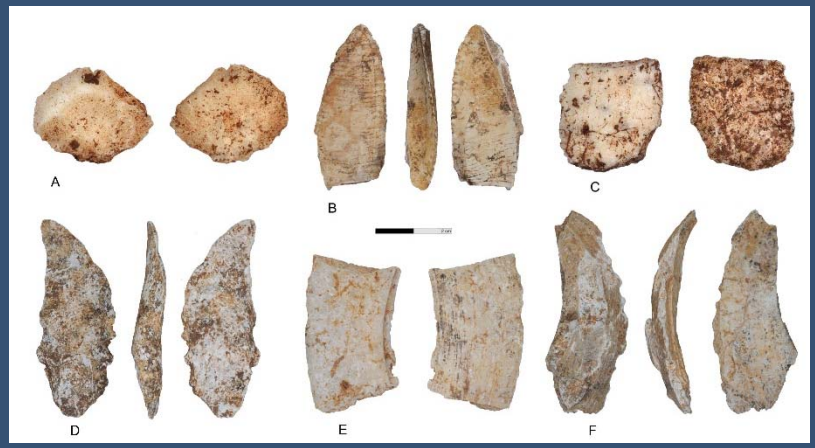
Experimental
Archaeological

Recurring breakage pattern: Longitudinal and transverse fracturing of the *Geloina* shells
Battering marks on the shells' umbo

Example: Splitting bamboo

Shell Technology in the Philippines

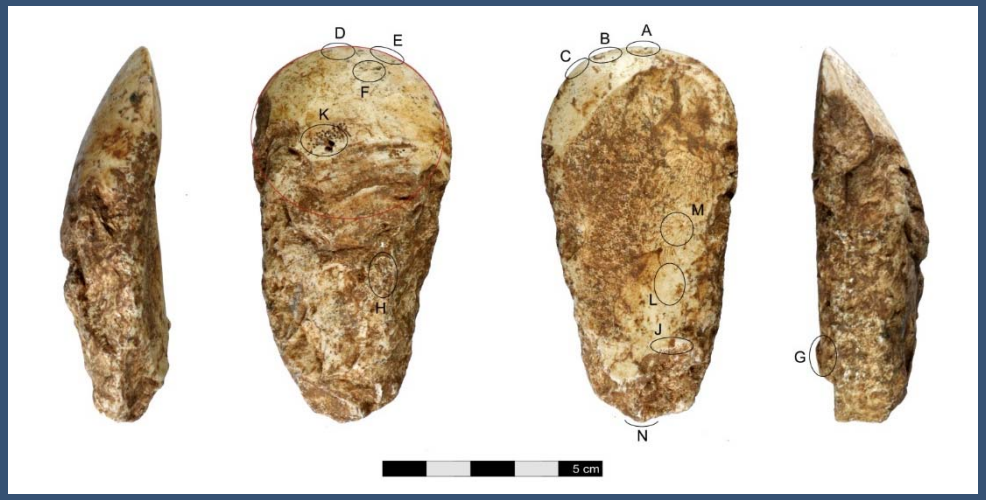
- Surprisingly little debate on shells, their potential for tool manufacture is mostly neglected
- Artefactual evidence (unlike wood and bamboo)
- Readily available in coastal areas
- Flaked shell tools are even dominant compared to lithic flakes in Bubog



Flaked *Tridacna* and *Geloina* artefacts from Bubog

- No chert source on Ilin Island, shells are abundant
- Flaking and grinding techniques were applied for tool production
- Shell tools complemented but also might have replaced lithic tools
- Solid structure and hardness of several marine bivalve species allow heavy duty uses, e.g. as chisels and adzes for woodworking

Shell Adzes from Mindoro



Edge-ground shell adze made of giant clam (*Tridacna gigas)* in Layer 8 of Bubog 1

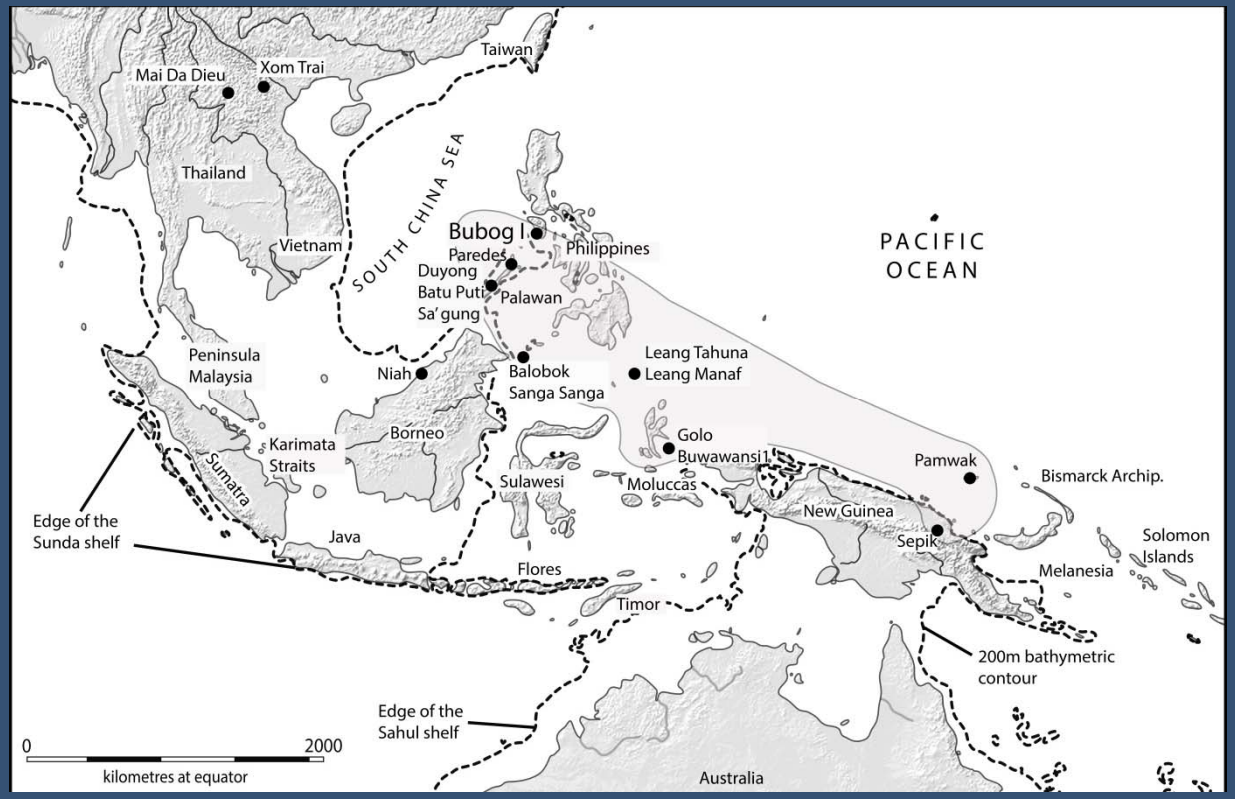
Direct ^{14}C date produced an age of 7550 – 7250 cal. BP.

Similar shell adze found in Bilat Cave across Ilin Channel in close distance to Bubog. A direct AMS ^{14}C date of 7414-7285 cal. BP matches the Bubog 1 adze.

Evidence for local production:

Bubog 2: Preform found in 2016 with a direct AMS ^{14}C date of 9115-8899 cal. BP

Shell Technology in ISEA and Melanesia



The geographic distribution of shell adzes lies along a route similar to the neolithic Lapita expansion several thousand years later.

Ground shell adzes were probably a technological innovation in the West-Pacific region, independent from lithic technology.

Ground stone adzes are only recorded in the later Holocene, and possibly introduced from the mainland after ca. 4000 BP.

Obsidian: Connecting Islands and Maritime Interaction

(Neri, Pawlik, Reepmeyer)

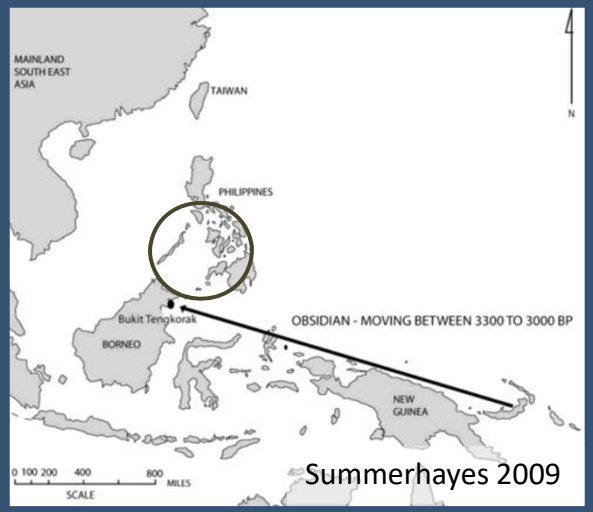
Obsidian artefacts found in Layer 9 and in Layer 10 below the shell midden.

P-XRF spectrometry: elemental signatures match obsidian artefacts from Ille Cave in northern Palawan

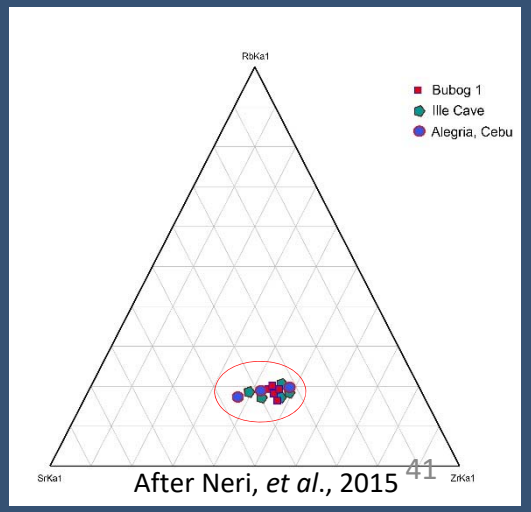
No obsidian sources in Palawan and Mindoro

Exploitation of a shared, yet unknown source

Future project will investigate the geochemical similarity with obsidian artefacts from Alegria on Cebu Island and possibly New Britain (PNG).



Summerhayes 2009



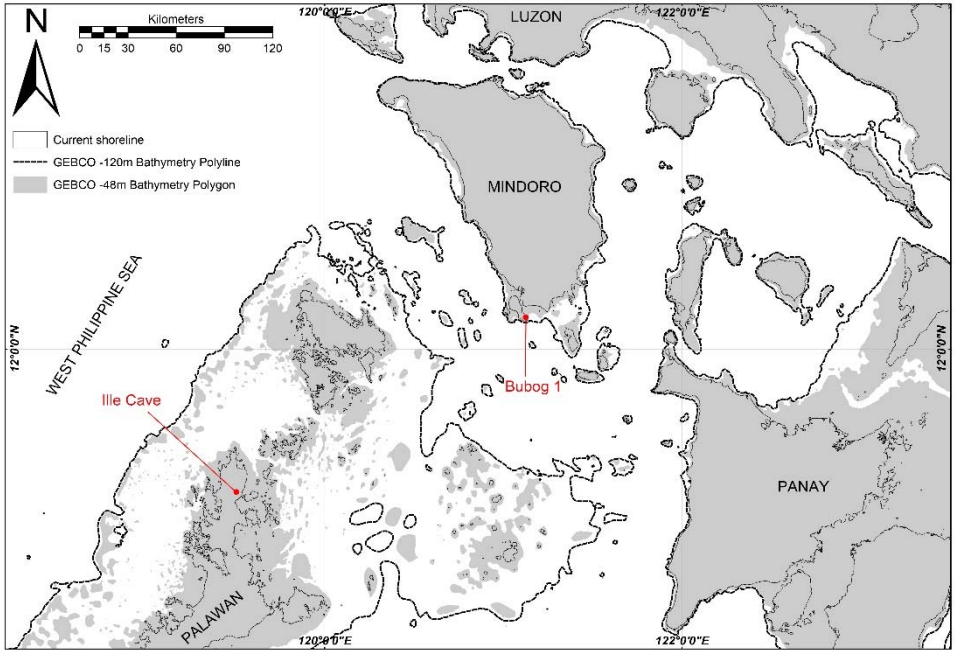
After Neri, *et al.*, 2015

Connecting Islands: Maritime Interaction

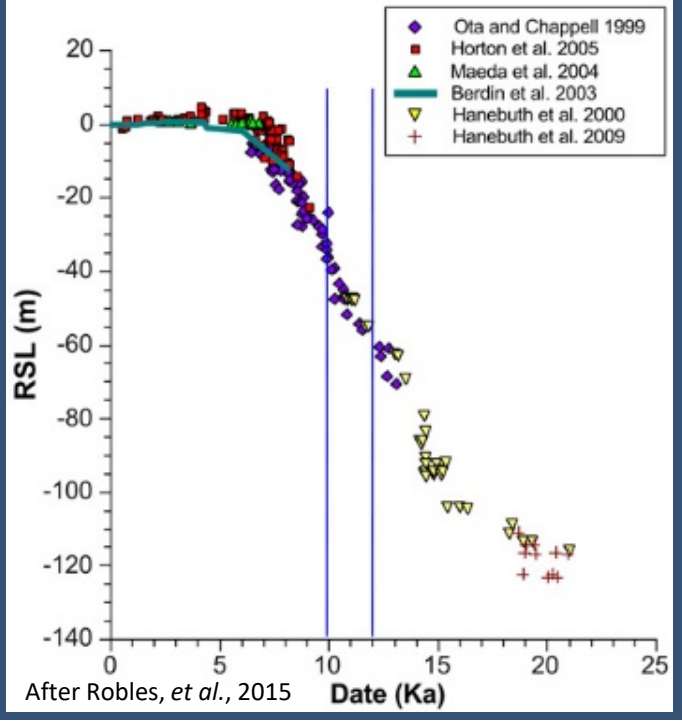
Obsidian artefacts suggest a cultural link between distant islands

Straight distance between Ille Cave and Bubog *c*. 210km, between Bubog and Alegria *c*. 400km

Open-sea faring and long-distance interaction also supported by remains of pelagic fishes and fishing hooks at Bubog



Reepmeyer 2015



After Robles, *et al.*, 2015

Archaeological Research in Mindoro continues

Fieldwork and Laboratory analysis of:

Shells and shell artefacts

Technology and strategies of tool use

Marine and terrestrial fauna

Macro- and microbotanical remains

Sedimentological and geochemical analysis

Palaeobiogeography and landscapes

Emergence of burial and the embedded ideologies

We expect further data on:

The occupation and peopling of Mindoro Island in the Upper Pleistocene

Maritime adaptation and long-distance interaction

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