TRINIL'S MAIN BONEBED (JAVA) AND *HOMO ERECTUS* PALEOBIOGEOGRAPHY

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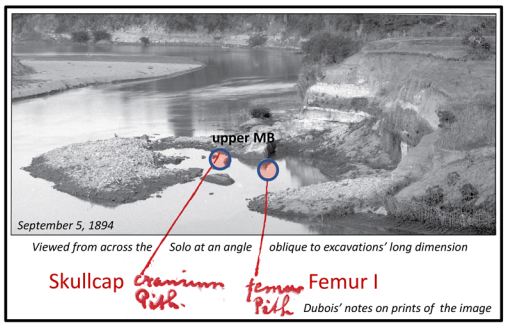
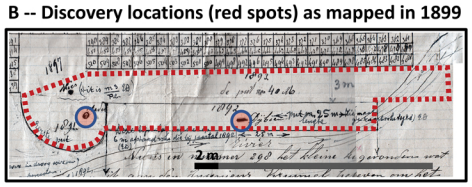
New documentation of Trinil's geology, discovery history, paleontology and paleogeography

A -- Discovery excavations in 1894 with Dubois' later spotting of the Skullcap and Femur I find points



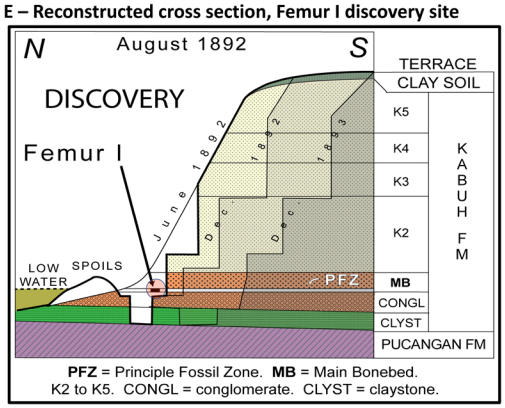
B -- Discovery locations (red spots) as mapped in 1899



DISCOVERY of the Skullcap and Femur I

The finds were made while excavating flat-lying bedrock along the south shore of the Solo River during low-water periods of 1891-1892 [A B]. The Skullcap was discovered beneath an ~40 m^2 natural MB outcrop ~6 weeks into the 1891 season [C D]. The next year, bedrock above the MB had to be removed to access more of the bed, which produced a "harvest of bones" when exposed at the end of June. A. de Winter, one of two dig supervisors, found Femur I in August. He remembered seeing *Stegodon* fossils near the find and losing femoral fragments while handling the specimen at the excavation. The supervisors' letters indicate that Femur I originated from the same ~20-cm stratigraphic concentration of fossils that had produced the Skullcap 12 m away [A B, above; PFZ in E, below]. Dubois visited Trinil in late July, returned in September, and never expressed doubt about the Skullcap and Femur I originating from one deposit. When the high bank south of the femur spot was dug away later in 1892, ~9 m of hard bedrock had to be removed to reach the MB [E]. The resulting 25-m-long back wall linked the 1891 and 1892 discovery points. In 1893 and 1896-1900, the crew continued removing the largely unfossiliferous bank to mine MB fossils near the seasonal low-water levels [E and F], substantiating Dubois' published portrayal of the site geology. The Selenka Expedition excavated next to the 1900 trench during 1907-1908, further confirming the concentration of vertebrate bioclasts in the MB at the site. [see also Huffman et al. 2015]

E – Reconstructed cross section, Femur I discovery site

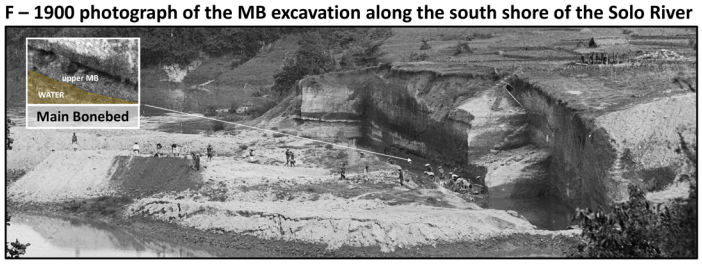


PFZ = Principle Fossil Zone. **MB** = Main Bonebed.
K2 to K5. CONGL = conglomerate. CLYST = claystone.

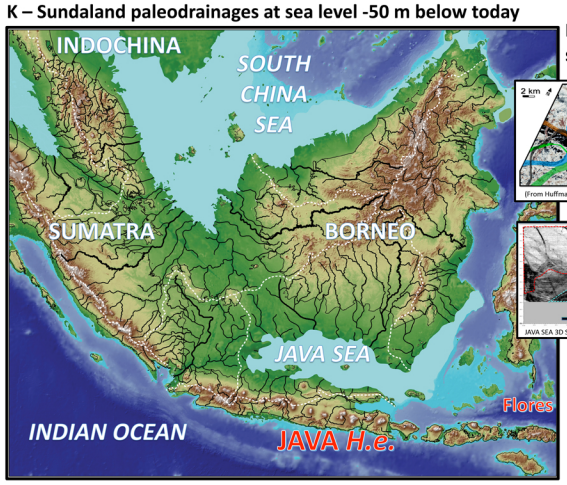
ABSTRACT

Trinil's Main Bonebed (MB; Hauptknochenschicht), the 1891-1892 *Homo erectus* (*H.e.*) discovery context [text panel, left], is still central to understanding hominin paleobiogeography in Sundaland. The MB was mostly well-lithified, volcaniclastic, very poorly sorted sandstone and pebbly conglomerate of fluvial origin, as remnant outcrops help establish [G and H]. The stratum produced thousands of well-preserved, disarticulated skeletal bioclasts [J]. Many were greatly oversized relative to lithic components [D to J]. The taphonomy, lithology and setting indicate accumulation in a lowland river during long-runout-lahar flooding. This followed mass deaths in the drainages of a high-standing, active stratovolcano [J]. Small-sized (*Axis*) deer, large-bodied bovids (*Bibos*; *Bubalus*), *Stegodon* and the tiny boselaphine *Duboisia* were most abundant as fossils [I]. Crocodylians, turtles, pig and rhinoceros were common. Other documented MB remains were tiger, muntjac, macaque, porcupine, river-fishes and -mollusks, and trees and sedges. Trinil specimens of dog, leopard cat, langur, gibbon, lizard, python, rat and birds are credible additional MB components. Femur I is a reasonably uncontestable MB discovery (as II, III and IV probably are), based on firsthand accounts and site geology [A to E]. Mussel shells from Trinil* reveal possible *H.e.* use, but no lithic artifacts or hominin-damaged bones have been identified. The diversity of taxa in the MB is greater than in any other individual *H.e.*-discovery bed. The MB fauna anchors Java's long-lasting *Stegodon-Homo erectus* (land-vertebrate) biostratigraphic sequence (*S.-H.e.*). *H.e.* was secure enough ecologically to withstand the associated Siva-Malayan large-mammal immigrations, endemic faunal developments, and glacioeustatic changes of the Early and Middle Pleistocene [K to L]. Certain *S.-H.e.* species went extinct, but relatives of others (e.g., MB cervids, large bovids, rhinoceros, pig, primates, tiger, turtles, crocodile, fishes and mollusks) survived into the Late Pleistocene-Holocene, when they occupied dispersed parts of the region extending from Java to Indochina. These biogeographic patterns support the proposition that *S.-H.e.*-like ecological communities, hominins included, were broadly present across Sundaland in the time of *H.e.* [A through L refer to other panels; * correction]

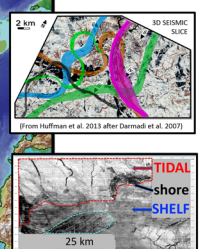
F – 1900 photograph of the MB excavation along the south shore of the Solo River



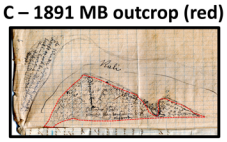
K – Sundaland paleodrainages at sea level -50 m below today



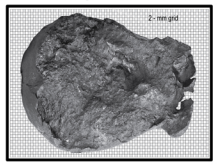
L – Rivers in 3-D seismic data sets



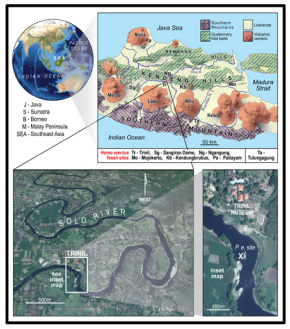
C – 1891 MB outcrop (red)



D – Skullcap with MB inside

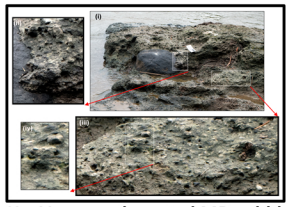


LOCATION IN THE SOLO RIVER



G – South-shore site today

MB baulks and remnants with Skullcap in red circle



H – Very poorly sorted MB pebble conglomerate with boulder (above) and cross bedding (left) in old baulks

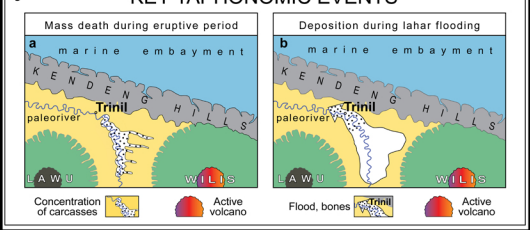
I – Main Bonebed FOSSILS (provenience established by linking firsthand excavation accounts to museum collections

Frequently found: *Axis lydekkeri* (probably a Hyelaphid deer), *Bubalus palaeokerabau* (extinct Asian Water Buffalo species), *Bibos palaesondaicus* (extinct Banteng; below left), *Stegodon trigonocephalus* (extinct), *Duboisia santeng* (extinct small bovid), *Crocodylus siamensis* (extant), Testudines (extant species; below right).

Also prominent: *Sus brachygnathus* (probably in the lineage of the extant Javan Warty Pig), *Rhinoceros sondaicus* (extant Javan Rhinoceros), *Panther tigris* (as extinct subspecies), mollusks (extant species), trees and fish (extant species).

J

KEY TAPHONOMIC EVENTS



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ACKNOWLEDGEMENTS: Joke Oppenoorth provided documents on the Selenka Expedition excavations. J. Andrews & L. Wood made the DEM (L) in 2013.

2018 *Paleoanthropology Society* Meeting (Austin) POSTER