

## Say it with *Flores* - an insight into hominid evolution and dispersion in southeastern Asia

Flores is one of the biggest, most rugged and most beautiful islands in the eastern Indonesian archipelago (also known as *Nusa Tenggara* or *Lesser Sunda Islands*). Flores owes its name to the Portuguese, who called its eastern cape, *Cabo de Flores*, meaning *Cape of Flowers*. Flores is located immediately northward of the geologically active Sunda Arc, which demarcates the active convergent plate boundary between the Australasian and Eurasian plates. Flores itself has 14 active volcanoes (see **Figure 1**) – only Java and Sumatra along this arc have more. Being located so close to a convergent plate boundary, Flores is not immune from the effects of large subduction-related earthquakes. On December 12th 1992, Flores experienced an earthquake measuring 7.8 that generated a large tsunami killing 3000 people in eastern Flores and flattened its largest town of Maumere.



**Figure 1:** View of Ebulobo Volcano (2124-m) located in central Flores. This symmetrical stratovolcano has a flat summit lava dome & contains a 250-m wide summit crater, breached on 3 sides. The last reported eruption occurred on 28th February 1969 (*Photo: BVA*).

Flores is an unusual blend of peoples – quite literally a crossroad between Asia and Melanesia. The people at the western end of the island are more “Malay”, while the other inhabitants of Flores are more Melanesian. The island’s 1.8 million people are divided into five main language and cultural groups: from west to east, the Manggarai (main town of Ruteng), the Ngada (Bajawa) (see **Figure 2**), the closely related Ende and Lio peoples (Ende), the Sikkonese (Maumere) and Lamaholot (Larantuka).



**Figure 2:** Ngada villagers celebrating the appointment of a new headman (Photo: BVA).

Many backpackers would be familiar with the coastal town of Labuhanbajo on the extreme western end of Flores. This town is a popular tourist staging point for recreational diving as well as for visiting the Komodo and Rinca Islands – the now protected home of the fearsome Komodo dragons (locally known as *ora*) (see **Figure 3**). However, what really elevated Flores as a travel destination was the startling discovery in 2003 of a new Hominid species (*Homo floresiensis*; also known as the Hobbit or Flo) unearthed at Liang Bua cave in west-central Flores by a team of Australian and Indonesian archaeologists. Here, a fairly complete skeleton including a near complete skull was recovered (LB1) along with remains of seven other individuals. LB1, determined to be that of 30-year old female, was estimated to have stood 1.06-m tall. Sophisticated stone artefacts were also found associated with the skeletal remains.



**Figure 3:** A fearsome looking Komodo Dragon on Rinca Island. Komodo Dragons are the largest members of the monitor lizard family (*Varanidae*) and the largest living species of lizard growing to maximum length of 3-meters and weighing up to 70 kg. Komodo Dragons represent a relict population of very large varanid lizards that once were common throughout Indonesia & Australia, most of which, along with other megafauna died out during the Quaternary (*Photo: BVA*).

In the aftermath of this discovery, there were many doubts as to whether these remains constituted a new species. Some argued that the remains were of a modern human with a neurodevelopmental disorder (microcephalic). However, orthopedic research supports species status for *H. floresiensis*. In particular, the wrist (carpal) bones have similarities to carpal bones of a chimpanzee or an early hominid such as *Australopithecus*. In 2009, the publication of a study of comparative body measurements provided further support for the hypothesis that *H. floresiensis* and *Homo sapiens* were in fact separate species.

Since the discovery of the LB1 the controversy regarding the status and placement of *H. floresiensis* on the evolutionary ladder has slowly receded away but ongoing research involving excavations continue. In May 2012, Brad Pillans from ANU and myself were invited by Mike Morwood (University of Wollongong,) and his Indonesian and US archaeological counterparts to review the volcanoclastic stratigraphy of two areas of Flores associated with faunal remains and artefacts - the So'a Basin near the town of Bajawa in central Flores and Liang Bua where *H. floresiensis* was first discovered near the town of Ruteng located in west-central Flores. What an incredible experience and opportunity this invitation afforded.

While in the So'a Basin, imagine the pleasure (and significance) of finding a hominid-made stone artefact (bifacial flake) sitting in a fossil soil (paleosol), preserved as it was discarded, beneath a volcanic deposit dated at around 1 million years old (see **Figure 4**), and then the very next day at another site - finding another stone artefact (radial core) sitting at the top of the paleosol and directly overlain by the same volcanic deposit (see **Figure 5**) - clear evidence of tool-making hominids were inhabiting Flores by 1 million years ago. Other sites revealed an assortment of faunal remains (see **Figure 6**) including *Stegodon* (an extinct group of animals related to mastodons, mammoths and elephants),

Komodo dragon and giant tortoise sometimes associated with stone artefacts. Efforts are continuing to find hominid remains that will hopefully clarify who made these tools – were they were they fabricated by *H. erectus* who had perhaps radiated eastward from Java and later became the evolutionary descendants of *H. floresiensis*.



**Figure 4:** Lower stratified (surge) unit of a widespread pyroclastic flow deposit overlying a prominent paleosol. Accretionary lapilli within the lower stratified unit are being indicated. This volcanic deposit has been Ar/Ar-dated at c. 1.02 Ma. Note the en-situ stone artefact (bifacial flake) below the hand within the underlying paleosol, Wolo Sege section, So'a Basin (Photo: BVA).



**Figure 5:** An en-situ stone artefact (radial core) occurring at the surface of a paleosol directly overlain by the basally stratified pyroclastic flow deposit, Mata Go section, So'a Basin (Photo: BVA).



**Figure 6:** Well-preserved faunal remains being excavated from a mudflow unit exposed within the Boa Lesa Trench, So'a Basin (Photo: BVA).

Visiting Liang Bua for the first time was an impressive experience. The cave entrance (50-m wide and 20-m high) is situated 200-m from the Wae Racang River and 30-m above the valley floor, but its not until you step inside that you realise just how big this cave is (see **Figure 7**). Inside, the cave is cathedral-like, a compact flat clay floor with stalactite chandeliers suspended above. Liang Bua

has always been a place of significance. For the last 10,000 years the dead have been placed here with ceremony. Liang Bua was first excavated in 1965 by Father Theodor Verhoeven (a Catholic priest based in Flores) who recovered six Neolithic burials with grave goods, and so began the history of research at Liang Bua that culminated in the discovery of LB1 in 2003 in sector VII at a depth of 6-m (see **Figure 8**).



**Figure 7:** A view of the interior of Liang Bua. Here in 2003, Mike Morwood (University of Wollongong) and his Indonesian archaeological counterparts discovered *H. floresiensis* in a 6-m deep excavation on the right-hand-side of the cave (Sector VII) (Photo: BVA).



**Figure 8:** View of the Sector VII excavation. Note the rhyolitic volcanic ash exposed towards the bottom of the excavation (Photo: Mike Morwood).

So now I'm preparing myself to return to Flores in August to continue with the mapping and description of volcanic deposits in the So'a Basin as well as sample

volcanic ash layers that are likely to be exposed in the upcoming Liang Bua excavations. Will these volcanic deposits assist with the age determination of faunal and hominid remains? What do these deposits indicate about the environment in which hominids inhabited? What role did eruptive activity on Flores have on local faunal turnover and extinction? Overall, there are so many unresolved questions about the timing and impact of successive hominid colonization in this part of southeastern Asia. Just who were the initial colonizers? From what ancestor did *H. floresiensis* evolve its small stature? Could this small size be a function of isolation and the limited food environment on Flores where its ancestor (*H. erectus*?) evolved a smaller body size (a type of speciation called insular dwarfism) like that which has been recorded in other animal species on Flores (i.e. *Stegodon*). Could *H. floresiensis* have existed on Flores at the time of the arrival of the first Portuguese ships during the 16th century? Certainly, Ngada oral accounts of Ebu Gogo (a hairy, pot-bellied, dwarf-sized, language-poor, cave dweller with a slight awkward gait and longish arms and fingers) - indicate they might well have.

So here I am .. playing a small role in this much larger and fascinating research story, and quite frankly .. living the dream ! Don't worry - I'm awake, pinching myself and at the same time - smelling the "Flores".



**Figure 9:** Mike Morwood and Brent Alloway at Wolo Sege, So'a Basin (Photo: BVA).