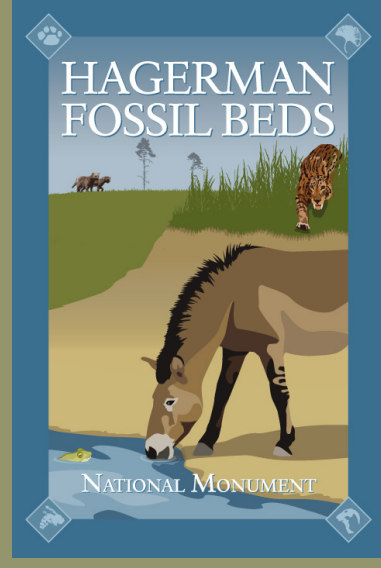


Vultures Moving in: Fossil Birds Suggest a More Open and Heterogeneous Landscape During the Oldowan-Acheulean Transition

K.A. Prassack*, M.C. Pante, J.K. Njau, L.M. McHenry, and I. de la Torre

*corresponding author, kariprassack@gmail.com



Introduction to the Study

- Olduvai Geology and Archaeology Project's (OGAP) multi-disciplinary inquiry into the behavioral and/or environmental causalities behind the Oldowan-Acheulean stone tool transition at Olduvai Gorge, Tanzania.⁽¹⁾
- Early Pleistocene birds from uppermost Lower, Middle, and lowermost Upper Bed II (Fig. 1).⁽²⁾
- 682 birds, including 77 previously undescribed from Leakey excavations.
- Uses avian community composition and taphonomic profiles to help infer the environmental context of this stone tool transition.

Birds as Environmental Indicators

- Birds can be excellent indicators of local environmental conditions.⁽³⁻⁴⁾
- Birds are evolutionarily conservative⁽⁵⁾ with many genera and even species from Olduvai found in today's East African ecosystems.
- Modern analogue studies of bird life histories (including neotaphonomic data) are especially applicable to Pleistocene studies.

Past Avifaunal Studies at Olduvai

- Lower Bed I (LBI, ~1.85Ma) at DK is east of the lakes center by Middle Bed II but would have been a lake margin environment during Lower Bed I.⁽⁶⁾ Cormorants dominate with the presence of medullary and juvenile bones suggesting a breeding colony. Other wetland birds are also common.
- Middle Bed I (MBI, FLK *Zinjanthropus* landscape, ~1.84Ma) avian diversity⁽⁷⁾ reflects topographical changes to the landscape caused, in part, from lake level fluctuations.⁽⁸⁾ Shorebirds, wetland, water, and bushland birds well-reflect other proxy-based reconstructions of this landscape as a raised peninsula surrounded by wetlands.⁽⁹⁾
- Lowermost Bed II (LMBII, ~1.78Ma) topography is shaped by a series of tectonically-induced hanging walls and foot walls⁽¹⁰⁾. Wetter environments prevail. High duck and rail diversity implies nutrient rich ponds.⁽¹¹⁾
- A landscape scale ecotaphonomic approach, utilized here, provides a more refined model of how the local environment changed at Olduvai over time.

Acknowledgments

OGAP fieldwork was funded by the National Science Foundation (BCS-0852292) and European Research Council (283366). OGAP thanks COSTECH and Tanzanian Antiquities for their continued support. Modern comparative collection loans were provided by the Yale Peabody Museum, American Museum of Natural History, Field Museum of Natural History, Los Angeles County Museum, and Hagerman Fossil Beds National Monument. Prassack thanks these museums for their cooperation and especially the OGAP directors for the opportunity to continue her work on the Olduvai birds. This poster includes data from an upcoming special issue in the Journal of Human Evolution⁽²⁾. Poster title based on lyrics from "Vultures" by PHISH, because Prassack could not resist.

References

- de la Torre, I., McHenry, L.J. et al. 2012. The Origins of the Acheulean at Olduvai Gorge (Tanzania): A New Paleoanthropological Project in East Africa. *Archaeol. Intl.* 15, 69–78.
- Prassack, K.A., Pante, M.C. et al. In Press. The paleoecology of Pleistocene birds from Middle Bed II, at Olduvai Gorge, Tanzania, and the environmental context of the Oldowan-Acheulean transition. *J. Hum. Evol.*
- Chambers, S.A., 2008. Birds as environmental indicators: review of the literature. In: Parks Victoria Technical Series 55, Melbourne.
- Finlayson, C., Carrión, J. et al. 2011. The *Homo* habitat niche: using the avian fossil record to depict ecological characteristics of Palaeolithic Eurasian hominins. *Quatern. Sci. Rev.* 30, 1525–1532.
- Louchart, A., Vignaud, P. et al. 2008. Fossil birds from the late Miocene of Chad and Ethiopia and zoogeographical implications. *Oryctes* 7, 147–167.
- Prassack, K.A. In Prep. A cormorant breeding colony and environmental conditions at DK, level 3, Lower Bed I, Olduvai Gorge.
- Prassack, K.A., 2010. Late Pliocene avifauna from the hominid-bearing *Zinjanthropus* land surface at Olduvai Gorge, Tanzania. In: Boles, W.E., Worthy, T.H. (Eds.), Proceedings of the VII Inter. Meet. Soc. Avian Paleontol. Evol. Rec. Austral. Mus. 62, 185–192.
- Stanistreet, I.G., 2012. Sequence stratigraphy of the Bed I and Bed II interval, Olduvai Gorge, Tanzania. *J. Hum. Evol.* 63, 300–308.
- Blumenschine, R.J., Stanistreet, et al. 2012. Environments and activity traces of Oldowan hominins across the FLK Peninsula during *Zinjanthropus* times (1.84 Ma), Olduvai Gorge, Tanzania. *J. Hum. Evol.* 63, 364–383.
- Stollhofen, H., Stanistreet, I.G., 2012. Plio-Pleistocene synsedimentary fault compartments, foundations for the eastern Olduvai Basin paleoenvironmental mosaic. *J. Hum. Evol.* 63, 309–327.
- Prassack, K.A., 2014. Landscape distribution and ecology of Plio-Pleistocene avifaunal communities from Lowermost Bed II, Olduvai Gorge, Tanzania. *J. Hum. Evol.* 70, 1–16.
- de la Torre, I., Albert, R.M. et al. In Press. The contexts and early Acheulean archaeology of the EF-HR landscape (Olduvai Gorge, Tanzania). *J. Hum. Evol.*
- Bibi, F., Pante, M.C., et al. In Press. Large mammals and fish from the Oldowan-Acheulean transition at Olduvai Gorge, Tanzania, and the paleoecology of the Serengeti. *J. Hum. Evol.*

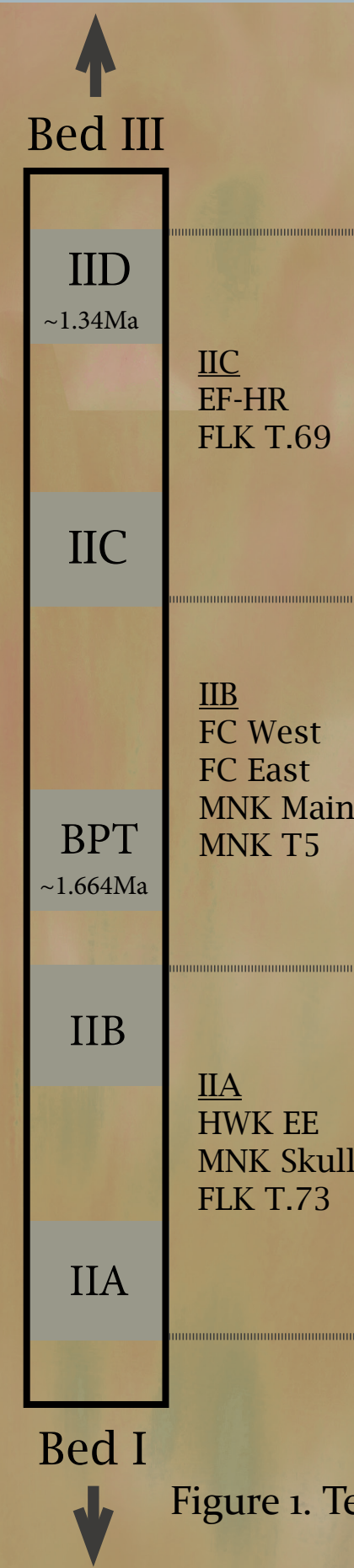


Figure 1. Temporal placement of avifaunal assemblages in Bed II, Olduvai Gorge. Grey boxes represent major tuffs.

The Bird's Word on Middle Bed II Environments

Assemblage IIC: Only one cormorant and duck were identified, but other proxies (diatoms, mammals⁽¹²⁾) suggest an open, drier landscape with poor preservation and abrasion indicative of an ephemeral, riverine environment.

Assemblage IIB: Dominance of cormorants at MNK, but no medullary or juvenile bone to suggest a breeding site. Low weathering, an owl at MNK, crane at FCW, and rodent gnaw traces at FCW and FCE suggests a lightly wooded grassland environment. Fig. 2-3

Assemblage IIA: HWK EE is diverse and suggests wet grasslands and deep waters to sustain fish^(2, 13). Heavy weathering supports this was a more exposed environment with minimal ground cover, but the presence of vulture, crow, raptor and cormorant fossils suggest trees in the area. FLK and MNK Skull fossils are inconclusive due to low numbers and poor preservation. Fig. 2-3

A Birder's Guide to Olduvai During Middle Bed II Times

- Cormorant Look in trees or on large boulders near permanent waters, depending on the species.
- Anhinga Thicker emergent vegetation and shallower, fresher waters than cormorants with a straight (not hooked) bill.
- Stork Tall and wet or short and dry grasslands depending on the species. Mixed roosts with cormorants and herons.
- Pelican Look for great white pelicans at the lake. If pink-backed are on your list, check out smaller ponds or large trees at HWK EE. If you "slept in", head over to FC W.
- Ibis Northern bald ibis is on the life list of any birder! Unlike most ibis, this one is most likely out on dry, grassy plains.
- Duck/Swan Hop in a time-machine and head for LMBII where numerous small eutrophic ponds likely dotted the landscape.
- Flamingo An easy bird to find. Stick to the shores and small inlet streams of the lake and look for masses of pink.
- Rail/Coot Catch that time machine. Their decline from LMBII suggests drier, more open with less emergent vegetation.
- Grebe Grebes are always around Olduvai, but never common. Away from deeper waters, you might find their remains at an owl roost at MNK (but don't check "grebe" off your birding checklist—dead birds don't count!)
- Shorebird Shorebirds occur in a range of habitats; your best bet is to head west towards the lake with a stop at HWK EE.
- Raptor Raptors usually mean trees, and MBII is the time to check the sky for eagles, owls, and even vultures soaring on thermals in search of their next meal.
- Ostrich You are more likely to find ostrich eggshell remains, but look to the grassy plains to the east towards Ngorongoro to find Olduvai's (and today's) largest land bird.
- Crow If you want to see a piapiac, you are better off in LMBII, but large crows may be perching in the trees near HWK EE.



A Bird in the Hand Means Two in the Bush (and other fun statistical inferences)

Diversity Measures	HWK EE	MNK	FCW	FCE
NISP	249	366	94	45
SIBA	89	162	25	10
# Families	13	8	7	3
MNI	25	20	9	3
Dominance	0.09	0.02	0.16	0.33
Shannon, H'	2.44	1.75	1.88	1.09
Equitability, J	0.95	0.84	0.97	1
Chao-1	16.75	10	10.33	6

So, What About Those Hominins?

Notable shifts in the Olduvai avifaunal community suggest at least localized changes with an opening and drying of the landscape by Upper Bed II times, but, as with the mammals, there is no clear evidence of a faunal turnover or major environmental change.⁽¹³⁾

Does this mean that the Oldowan-Acheulean technological shift was not an adaptive response to a changing climate? Perhaps. Environmental fluctuations are evident in Bed I with no associated technological shifts.^(7,11) However, hominin's may have responded to environmental changes (including increased patchiness of habitats and/or resources) on a different spatial/temporal scale than other fauna. Perhaps it was a series of small regional events, not yet recognizable by us in the fossil record, that facilitated this technological revolution. To be continued....



Fig. 2. A) *Phalacrocorax owrei/africanus* (MNK), cranial aspect of distal left humerus. B) *Phalacrocorax owrei/africanus* (MNK), caudal aspect of proximal left humerus. C) *Phalacrocorax owrei/africanus* (MNK), ventral aspect of complete right ulna. D) (left) complete left ulna modern *Anhinga* sp. compared to *Anhinga* sp. (HWK EE). E) *Pelecanus rufescens* (HWK EE), medial/posterodorsal aspect of complete right quadrate. F) plantar aspect of distal right tarsometatarsus of Threskiornithidae indet. (HWK EE). G) Dorsal aspect of distal left coracoids of (left) *Grus canadensis* (center) *Grus cf. carunculatus* (FC West), and (right) *Balaerica regulorum*. Scale bars at 5mm.

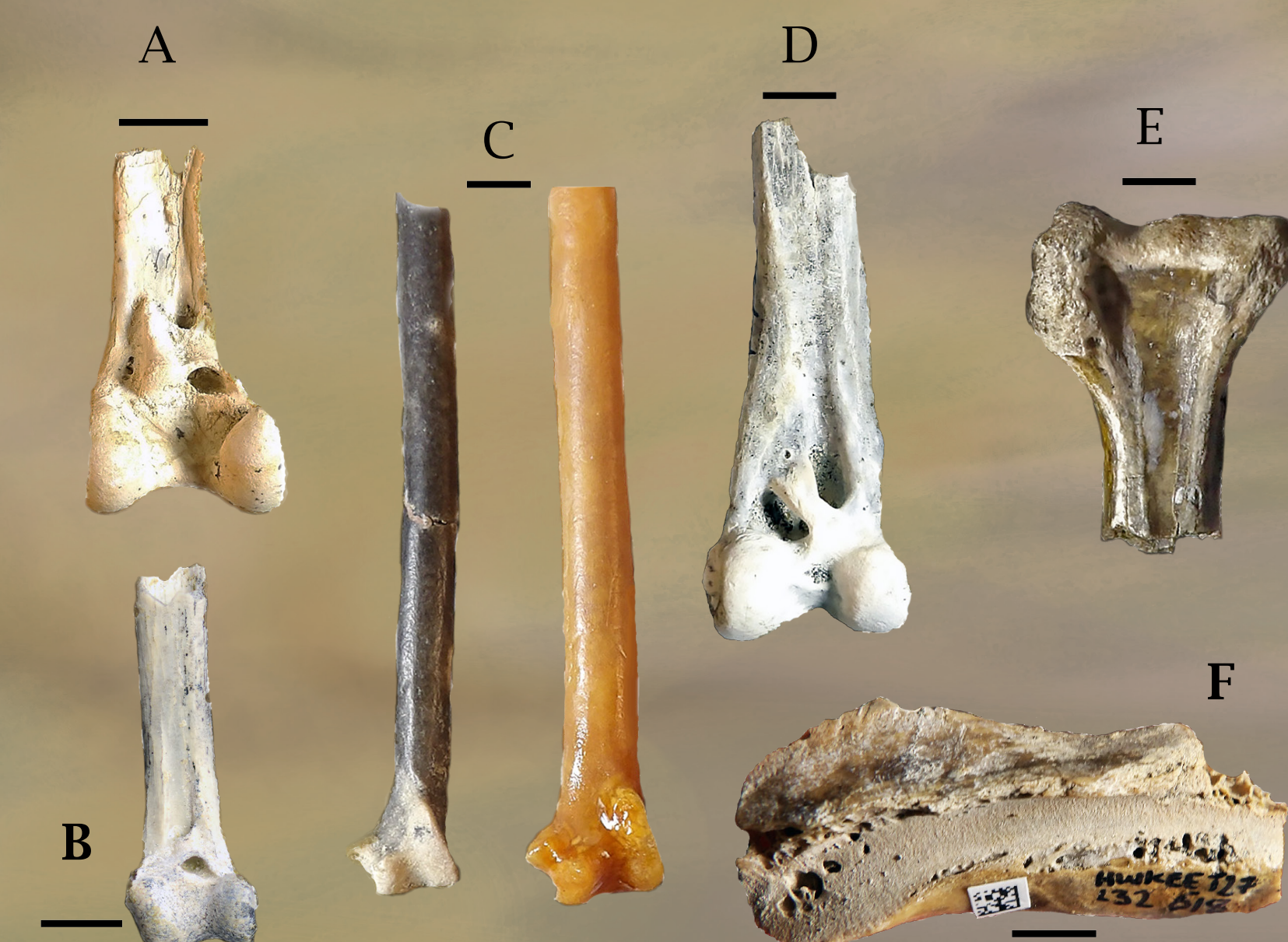


Fig. 3. A) *Phoeniconaias minor* (HWK EE), cranial aspect of distal left tibiotarsus. B) *Tachybaptus ruficollis* (MNK T5), cranial aspect of distal right tibiotarsus. C) Ventral aspect of distal right ulna of (left) cf. *Tyto alba* (MNK T5) compared to (right) *Tyto alba*. D) affinis *Aquilina* (HWK EE), cranial aspect of distal left tibiotarsus. E) cf. *Accipitrinae* (MNK), ventral aspect of medial right phalanx. F) cf. *Aegypinae* indet. (HWK EE), cranial aspect of sternum. Scale bars 10mm for A-C and F; 5mm for D-E.