The effects of termites on mammal and bird bone

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A variety of insect taxa have been shown to modify bones with their mandibles, including the larvae of Dermestidae, Tenebrionidae, Calliphoridae, Tineidae as well as some known Families of termites, of the Order Isoptera. Bone modification criteria are well documented for a number of these taxa, largely due to the fact that such studies have a wide spectrum of application, but the effects of termites on bones remain under-studied.

From as early as 1911 researchers began to make in-field observations in relation to termite activity and their impact on faunal remains. Derry found that in both Egyptian and Nubian graves mummies had been attacked by termites, primarily the skulls were encrusted with matrix, showing extensive signs of tunnelling, which often resulted in parts of the cranium wall being almost completely destroyed. The impact of termites on cranial material has also been observed in China, Australia, Kenya, Panama and Peru. Additionally, post cranial modification has also been either observed or inferred, and it has been shown that termites can completely destroy a skeleton. Unfortunately existing literature on termite damage to bone is ambiguous, as some researchers have intuitively inferred termites from specific modifications found on human and other animal remains without empirical data to support

such conclusions, whilst other researchers attribute similar modifications to ants or dermestid beetles. The only actualistic study available in the literature concerns Australian termites and it provides only a general description of the resulting modifications.

The aim of this research was to produce experimentally, document microscopically and analyse in detail the modifications caused by African termites. A neoichnological experiment was conducted over the period of one year in the dolomitic grassland close to the hominid-bearing sites within the Cradle of Humankind, South Africa. Thirty-four bone fragments derived from mammals and aves, of varying type (compact, spongy, thin and thick cortical bone), and exhibiting different levels of preservation (fossil, weathered and fresh) were inserted into *Trinervitermes trinervoides* mounds, which belong to the Family Nasutitermitinae. The research design was aimed at determining whether or not termites modify bones, and if so, the type of damage they produce, its distribution, if particular bone types are favoured, and whether higher rates of modification are evident during the summer or winter months.

After six and twelve months the experimental bone fragments were removed and analysed using an Olympus SZX 16 Multifocus microscope fitted with a digital camera at magnifications between 7 and 115x. Surface modifications were moulded using Coltene President light body dental elastomer. Resin replicas (Araldite M resin) obtained from these moulds were observed with a JEOL JSM-840 scanning electron microscope at magnifications between 60 - 600x. Results show that *Trinervitermes*, the most widely distributed termite found in South Africa, modifies bone in a number of ways. All experimental bones bear one or a combination of macro- and microscopic surface modifications that include star-shaped pit marks, multiple parallel incisions along edges, large borings, tiny pinprick holes and etching of the outer cortical lamellae.