Dentognathic remains of *Australopithecus afarensis* from Nefuraytu (Woranso-Mille, Ethiopia): Comparative description, geology, and paleoecological context

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ARTICLE INFO

ABSTRACT

Australopithecus afarensis is the best-known and most dimorphic species in the early hominin fossil record. Here, we present a comparative description of new fossil specimens of *Au. afarensis* from Nefuraytu, a 3.330–3.207 million-years-old fossil collection area in the Woranso-Mille study area, central Afar, Ethiopia. These specimens include NFR-VP-1/29, one of the most complete mandibles assigned to the species thus far and among the largest mandibles attributed to *Au. afarensis*, likely representing a male individual. NFR-VP-1/29 retains almost all of the distinctive archaic features documented for *Au. afarensis*. These features include a posteriorly sloping symphysis, a low and rounded basally set inferior transverse torus, anterosuperiorly opening mental foramen, a lateral corpus hollow bound anteriorly by the C/P$_3$ jugae and posteriorly by the lateral prominence, and the ascending ramus arising high on the corpus. Dental morphology and metrics of the Nefuraytu specimens also falls within the range of *Au. afarensis*. The presence of this species at Woranso-Mille between 3.330 and 3.207 million years ago confirms the existence of this species in the area in close spatial and temporal proximity to other middle Pliocene hominin taxa such as the one represented by the Burtele foot (BRT-VP-2/73) and the recently named species *Australopithecus deyiremeda*. This has important implications for our understanding of middle Pliocene hominin diversity.

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1. Introduction

Australopithecus afarensis is one of the best known hominin species in the Pliocene fossil record and hypothesized to be the direct descendant of the 4.2–3.9 Ma *Australopithecus anamensis*

(Leakey et al., 1995, 1998; Ward et al., 2001; White et al., 2006). Its remains have been recovered from sites in Ethiopia, Kenya, and Tanzania from deposits ranging in age from 3.7 to 2.9 million years ago (Ma) (Johanson and Taieb, 1976; Taieb et al., 1976; Johanson et al., 1978a,b, 1982a,b,c; Kimbel et al., 1985, 1994, 2004; Kimbel and White, 1988; White et al., 1993, 2000; Brown et al., 2001; Kimbel and Delezene, 2009; Harrison, 2011; Mbua et al., 2016). The best sample of the species comes from Hadar, in the Afar region of Ethiopia, where hundreds of specimens representing males and

females of juvenile and adult individuals have been recovered since the early 1970s (Johanson and Taieb, 1976; Johanson et al., 1978a,b, 1982a,b,c; Kimbel et al., 1994, 2004). The large sample size and presence of *Au. afarensis* in a continuous stratigraphic succession at Hadar has been instrumental in addressing questions related to sexual dimorphism (Kimbel and White, 1988; Kimbel et al., 1994; Lockwood et al., 1996) and temporal trends in morphological variation in the species (Lockwood et al., 2000).

Multidisciplinary investigations at the Woranso-Mille paleontological study area (Fig. 1), located north of Hadar (Taieb et al., 1976) and Ledi-Geraru (Dupont-Nivet et al., 2008), were initiated in 2004 (Haile-Selassie et al., 2007). Some of the areas within the Woranso-Mille study area were visited in the 1970s by members of the Rift Valley Research Mission in Ethiopia (RVRME), who collected fossil remains (mostly suids and cercopithecids) from various localities (Kalb, 2001). Since 2004, the Woranso-Mille project has thus far collected more than 9000 vertebrate fossil specimens from more than 85 identified localities ranging in age from >5.4 Ma to ca. 3 Ma. More than 65 mammalian taxa, including a number of species that are new to science, have been identified as of the end of the 2015 field season. Of the total number of fossil specimens collected thus far, ca. 145 specimens belong to multiple
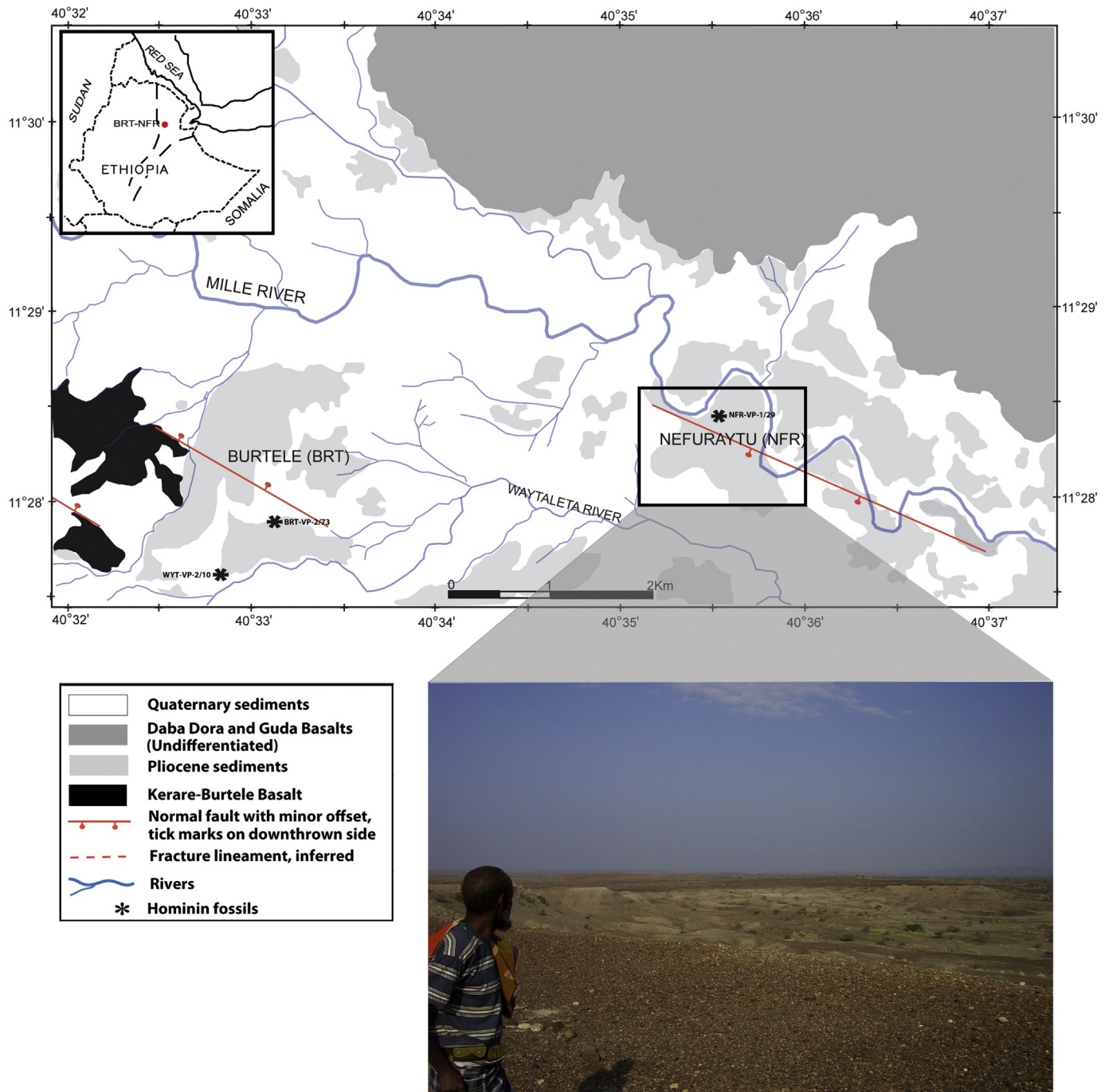

Figure 1. A geological map showing the location and lithology of the Burtele-Nefuraytu (BRT-NFR) localities within the Woranso-Mille study area. The image below shows a panoramic view of the fossiliferous sediments at Nefuraytu.