

Early hominins and paleoecology of the Koobi Fora Formation, Lake Turkana Basin, Kenya

René Bobe, João d'Oliveira Coelho, Susana Carvalho, and Meave Leakey

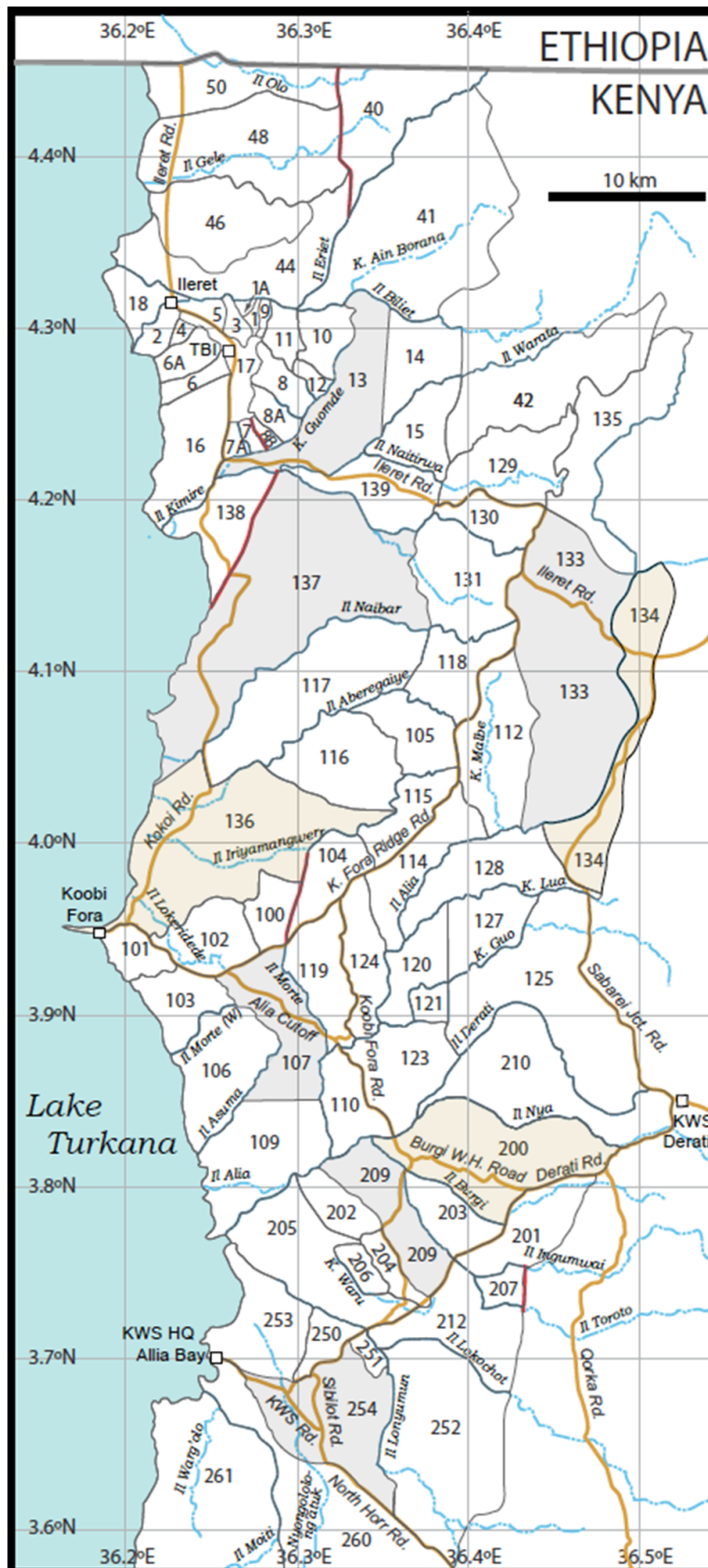
Appendix to Chapter 26

In: *African Paleoecology and Human Evolution*, S.C. Reynolds and R. Bobe, editors,
Cambridge University Press, Cambridge, 2022.

Appendix

Paleontological Collection Areas

Fossiliferous sediments of the Koobi Fora Fm are discontinuously exposed across the east side of Lake Turkana over an area of about 1200 km² (Brown and Feibel, 1991). East Turkana can be informally subdivided into three major regions: the Ileret Region in the north, the Koobi Fora Region in the center, and the Allia Bay Region in the south. These regions are further subdivided into Ileret and Il Dura (within the Ileret Region), Il Naibar Lowlands, Karari Ridge, Koobi Fora Ridge, and Bura Hasuma (within the Koobi Fora Region), and Sibilot and Southern Allia Bay Plains (within the Allia Bay Region). In the early 1970s, John Harris and Ian Findlater divided these regions into Paleontological Collecting Areas that covered all the known fossiliferous exposures. Numbers from 1 to 50 have been assigned to the Ileret Region, numbers from 100 to 139 to the Koobi Fora Region, and numbers from 200 to 261 to the Allia Bay Region (Brown and Feibel, 1991; Leakey and Leakey, 1978) (see [Table 1](#) in the main text). Note that not all numbers in this sequence are used. This numbering scheme, although originally useful for assigning fossils to specific geographical locations, left some areas that were poorly defined, or too large in extent, or based on maps that were not congruent. Thus, Frank Brown and colleagues set out to revise and provide explicit definitions for each area. They also subdivided the largest area (Area 40) into four parts. This revised scheme does not change the area assigned to the vast majority of fossils from the Koobi Fora Fm, except for the small samples that have been collected in recent years from Area 40. The new map is provided in this chapter as [Figure 26.3](#) and also as [Supplementary Figure 26.1](#), and below we provide a synoptic description of each area based on notes by Frank Brown. Geographic names of the Koobi Fora region have been well-published and we refer the reader to these works (Brown et al., 2006; Harris, 1991b; Isaac, 1997).



Supplementary Figure 26.1. Map of collecting areas of the Koobi Fora Formation revised and modified by Frank Brown.

Ileret Region

Area 1 is bounded on the south by the limit of exposure of Pliocene and Pleistocene strata, on the west along a line through an area covered by alluvium, on the north by the ephemeral river known as Il Eriet, and on the east by the bed of a small tributary to Il Eriet. Strata belong to the upper part of the KBS Mb, the Okote Mb, and the Chari Mb, ranging in age from ~1.7 to ~1.4 Ma.

Area 1A is small triangular area bounded on the east by a band of alluvium, as it is on the west. The northern boundary is Il Eriet. Strata belong to the upper part of the KBS Mb and the Okote Mb, ranging in age from ~1.7 to ~1.45 Ma.

Area 2 includes the town of Ileret, and it is bounded on the northwest by Il Eriet, on the east mainly by the Ileret Road, on the southwest by four arbitrary line segments through areas with little or no exposure, and by Lake Turkana on the west. Strata belong to the Okote Mb and Chari Mb, ranging in age from ~1.5 to 0.7 Ma.

Area 3 is bounded on the south by the limit of exposure of Pliocene and Pleistocene strata, on the west by a line through an area with no exposure of Pliocene or Pleistocene strata, on the north by Il Eriet, and on the east through an area with no exposure of Pliocene or Pleistocene strata and then along the bed of a tributary to Il Eriet. Strata belong to the Okote Mb and Chari Mb, ranging in age from ~1.45 to somewhat less than 0.75 Ma (Silbo Tuff).

Area 4 bounds Area 2 to the northwest along a line through areas of little exposure, and ends at the limit of exposure of Pleistocene strata to the northeast on Ileret Ridge. The southeastern boundary is made by five arbitrary segments through areas with little exposure of Pliocene or Pleistocene strata. Strata belong to the Okote Mb and Chari Mb, ranging in age from ~1.45 to somewhat less than 0.75 Ma.

Area 5 is bounded on the southwest by the Ileret road, and by the outcrop edge of Pleistocene strata, on the north by Il Eriet, and on the east by a line through an area with no exposure of Pliocene or Pleistocene strata. The Turkana Basin Institute compound is in Area 5. Strata belong to the Chari Mb, ranging in age from ~ 1 Ma to somewhat less than 0.7 Ma.

Area 6 is the southernmost of the productive fossil collection areas along the western side of Ileret Ridge. Its southern boundary is within an area of bushland south of the principal exposures in the area, its western boundary is Lake Turkana, and its northern boundary runs through an area of limited exposure. The eastern boundary is the limit of exposure of Pliocene and Pleistocene strata. Strata belong to the upper KBS, Okote, and Chari Mbs, ranging in age from ~1.7 to 1.3 Ma.

Area 6A has a southern boundary through an area of limited exposure, its western boundary is Lake Turkana, and its northern boundary is an arbitrary line separating it from Area 2 in the west and Area 4 in the east, along which there is little exposure of Pliocene or Pleistocene strata. The eastern boundary is the limit of exposure of Pliocene and Pleistocene strata. Strata belong to the Okote and Chari Mbs, ranging in age from ~1.5 to 1.3 Ma.

Area 7 is bounded by an unnamed tributary to Kolom Guomde on the west, by the limit of exposure of Pliocene and Pleistocene strata on the north, by a fault and the course of an ephemeral stream on the east, and by Kolom Guomde on the south. Strata belong to the Chari Mb, ranging in age from ~0.8 to < 0.75 Ma.

Area 7A is bounded by the Ileret Road on the west, by the limit of exposure of Pliocene and Pleistocene strata on the north, by an unnamed tributary to Kolom Guomde on the east, and by Kolom Guomde and the Ileret Road on the south. Strata belong to the Okote and Chari Mbs, ranging in age from ~1.55 to 1.3 Ma.

Area 8 is bounded on the southwest by a complicated line drawn through an area of exposure of Pliocene and Pleistocene strata and extending through an area covered by alluvium, then into the bed of a tributary to Kolom Guomde. On the west it ends at the edge of exposure of Pliocene and Pleistocene strata, and its northeastern boundary is a line drawn through areas with little or no exposure of Pliocene or Pleistocene strata and, in the eastern part, along the bed of a tributary to Kolom Guomde. The southeastern boundary is Kolom Guomde. Strata belong to the KBS and the Okote Mbs, 1.87 to 1.38 Ma.

Area 8A is bounded on the southwest by a line through an area of alluvium, on the west by the limit of exposure of Pliocene and Pleistocene strata, and on the northeast by a complicated line drawn through an area of exposure of Pliocene and Pleistocene strata that extends through an area covered

by alluvium and then into the bed of a tributary to Kolom Guomde. The southeastern boundary is Kolom Guomde. Strata belong to the KBS and Okote Mbs, 1.87 to 1.38 Ma.

Area 8B is bounded by a fault and the course of an ephemeral stream on the west, by the limit of exposure of Pliocene and Pleistocene strata on the north, by a line through an area of alluvium on its northeast, and by Kolom Guomde on the south. Strata belong to the Okote Mb, with a probable age range of 1.55 to 1.45 Ma.

Area 9 is a slender area bounded on the south by the limit of exposure of Pliocene and Pleistocene strata, on the west along the stream bed on a small tributary to Il Eriet, on the north by Il Eriet, and on the east by the bed of a tributary to Il Eriet for the northern part, and in the southern part by a line through an area covered by alluvium. Strata exposed in this area belong to the upper KBS and Okote Mbs, ~1.7 to 1.4 Ma.

Area 10 is bounded by a line through an area with little exposure of Pliocene or Pleistocene strata on the southwest, on the west by a line through alluvial cover and then along a tributary to Il Eriet. The northern boundary is marked by the bed of Kolom Ain Borana (a tributary to the Il Eriet), and the eastern boundary is placed along the bed of a tributary to Kolom Ain Borana, and then along the main course of the Kolom Guomde. Strata belong to the upper Burgi Mb, the KBS Mb, and perhaps the lower part of the Okote Mb, ranging in age from ~2 Ma to ~1.55 Ma.

Area 11: The southwestern boundary of this area is through a region with alluvial cover; the western boundary likewise runs through an area with alluvial cover to the bed of Kolom Murriech, which constitutes the northern half of the western boundary. The northern boundary is Il Eriet, and the eastern boundary follows a tributary of Il Eriet, and then runs through an area covered by alluvium to the drainage divide between Il Eriet and Kolom Guomde. Strata belong to the KBS and Okote Mbs, ranging in age from ~1.8 Ma to ~1.5 Ma.

Area 12 has as its southwestern boundary a line drawn through areas with little or no exposure of Pliocene or Pleistocene strata and, in the eastern part, along the bed of a tributary to Kolom Guomde. Likewise, its western boundary is drawn through an area with little to no exposure of Pliocene or Pleistocene strata. The southeastern boundary is Kolom Guomde. Strata belong to the upper Burgi and KBS Mbs, with a probable age range from 1.9 to 1.6 Ma.

Area 13 is bounded by Il Warata and Il Kimire on the south, Kolom Guomde on the west and northwest, and by Kolom Ain Borana and Il Biliet on the north to an arbitrary straight line separating it from Area 14 to the east. Strata belong to the Lonyumun Mb, a combined Moiti-Lokochot, the Tulu Bor Mb, upper Burgi Mb, and the KBS Mb. Strata below the disconformity are 4.2 to 3.4 Ma; those above the disconformity (upper Burgi and KBS) probably lie in the range 2.0 to 1.8 Ma.

Area 14 is bounded by Il Warata on the south, an arbitrary straight line on the west extending from Il Warata to Kolom Biliet, the course of Il Biliet to a point (4.3°N, 36.396°E), thence southward to the course of Il Warata at 4.271°N, 36.396°E. Strata belong to the Lonyumun Mb, ranging in age from ~4.3 to 4.0 Ma.

Area 15 is bounded by Il Naitirwa on the south, Il Warata on the north, and the limit of Pliocene strata on the east. Strata belong to the Lonyumun Mb, ranging in age from ~4.3 to 4.0 Ma.

Area 16 is bounded by Il Kimire on the southeast, by Lake Turkana on the west, by the southern limit of prominent outcrops to the northwest, by the Ileret road and the lower course of Kolom Guomde on the east. Exposures are poor. Known strata belong to the upper part of the KBS Mb and the Okote Mb, thus with an age range of ~1.7 to 1.45 Ma. There also may be some exposures of the Chari Mb.

Area 17 encompasses the area in which Pliocene and Pleistocene strata are not exposed along the Ileret Ridge. Its boundaries are thus placed along the edge of outcrop with areas of exposure east and west of the Ileret Ridge except that the Ileret Road forms its boundary with Area 16. No Pliocene or Pleistocene strata are known from this area.

Area 18 is defined by two prominent branches of the delta of Il Eriet and the shore of Lake Turkana. No Pliocene or Pleistocene strata are known from this area.

Area 40 (redefined here): Here we redefine Area 40 as including only the area north and west of Il Eriet that is bounded by the North Gele Fault on the west, the Ethiopian border on the north, and Il Eriet on the east. Strata belong to the Lonyumun, Moiti, Lokochot, Tulu Bor, and upper Burgi Mbs, thus ranging from 4.3 to 2.0 Ma; however there are at least two disconformities in the section.

Area 41 is bounded by Il Eriet on the west, by the limit of Pliocene and Pleistocene strata on the east, and by Kolom Biliet and Kolom Ain Borana on the south. Strata belong to the Lonyumun, Moiti,

Lokochot, upper Burgi, and KBS Mbs. The age range is thus from 4.3 Ma to ~1.75 Ma, with a hiatus from at least 2 to 2.5 Ma.

Area 42 is bounded by Il Warata on the north to the edge of the Gombe Basalts that cap the Suregei Plateau, then follows the drainage divide between Il Warata and Il Naitirwa and along the contact with volcanic rocks and Pliocene and Pleistocene sedimentary deposits. The western boundary is placed at the beginning of exposure of Pliocene and Pleistocene sedimentary strata to the west. No strata belonging to the Koobi Fm have been recorded from this area.

Area 44 (defined here): Here we define a new area as that bounded by the North Gele Fault and Il Eriet on the east and south, by Lake Turkana on the west, and by the drainage divide between Il Saparei and Il Eriet and then the drainage divide between Il Eriet and Il Gele in the north. Strata in this area belong to the upper Burgi, KBS, Okote, and Chari Mbs, ranging in age from ~2 to <0.75 Ma.

Area 46 (defined here): This area is bounded by the drainage divide of Laga Saparei on the north, east, and south, and by Lake Turkana on the west. Strata probably belong to the Okote and Chari Mbs.

Area 48 (defined here): This area is bounded by the drainage divide between Il Gele and Il Eriet and Laga Saparei on the south, by Lake Turkana on the west, the drainage divide between Il Gele and Il Olo in the north, and the North Gele Fault in the east. Strata in this area belong to the upper Burgi and KBS Mbs, based on current knowledge.

Area 50 (defined here): This area is bounded by the drainage divide with Il Gele on the south, by Lake Turkana on the west, the border with Ethiopia in the north, and the North Gele Fault on the east. Strata belong to the upper Burgi and KBS Mbs, based on current knowledge.

Koobi Fora Region

Area 100 lies on the north side of Koobi Fora Ridge east of Area 102. Its southern boundary is the Koobi Fora Ridge Road; its western boundary is principally along the bed of an unnamed minor stream. Its eastern boundary (with Area 104) is along a prominent fault, and its northern boundary is the contact of Pleistocene strata with later alluvium. Strata in this area belong to the upper Burgi Mb, ranging in age from ~2.0 to ~1.9 Ma.

Area 101: This area lies nearest the Koobi Fora Research Station; it is bounded on the north and east by the Koobi Fora Road, on the south mainly by a drainage divide, and on the west by the shore of Lake Turkana. Strata belong to the upper part of the KBS Mb and the lower and middle parts of the Okote Mb, ranging in age from ~1.75 Ma to 1.45 Ma.

Area 102 is bounded by the Koobi Fora Ridge road on the south and west, by the limit of contiguous exposures on the north, and principally by the bed of an unnamed minor stream on the east. Most strata belong to the upper Burgi Mb and the lower part of the KBS Mb. Low exposures in the north of the area are believed to belong to the lower Burgi Mb below a disconformity. Strata above the disconformity range in age from ~2 Ma to ~1.7 Ma.

Area 103 is bounded by Lake Turkana on the west, by a drainage divide between it and Area 101 on the north along with the Koobi Fora Ridge Road. Its eastern boundary is at the end of a prominent exposure, and the southern boundary with Area 106 is along the bed of a prominent ephemeral stream. Strata in the area dip west and are repeated by several north-south normal faults. They belong to the upper part of the KBS Mb and the Okote Mb, ranging in age from ~1.8 to 1.4 Ma.

Area 104 is bounded on the south by the Koobi Fora Ridge Road, on the west by a prominent fault that separates Area 104 from Area 100, on the north by the course of Il Iriyamang'werr, and on the east by the old road (no longer in use) from points south to Ileret. Strata in Area 104 belong to the upper Burgi Mb, the KBS Mb, and the lower part of the Okote Mb, ranging in age from ~2 to 1.5 Ma (Lepre and Kent, 2015).

Area 105 is bounded on the east by the Koobi Fora Ridge road, on the northeast and north by Il Aberegaiye, on the west by tributaries to Il Aberegaiye and Il Iriyamang'werr, and on the south by Il Iriyamang'werr. Strata belong to the upper Burgi Mb, the KBS Mb, and the lower part of the Okote Mb, ranging in age from ~2 to 1.5 Ma.

Area 106 extends on the northeast to the edge of prominent exposure, on the south to Kolom Asa, on the west to Lake Turkana, and on the north to the ephemeral stream Il Morte (W) that separates it from Area 103. Strata in this area belong to the KBS Mb, ranging in age from ~1.9 to ~1.6 Ma.

Area 107 is bounded on the south by an east-west line, on the west by Kolom Asa and then by the edge of exposures in Areas 106 and 103. Its northern boundary is the Koobi Fora Ridge Road, and its

eastern boundary is Il Morte, an ephemeral stream that separates it from Area 119. It is bisected by the Alia Cutoff road. Strata in this area belong mainly to the KBS Mb, 1.87 to 1.55 Ma.

Area 109: Il Alia forms the southern (in part) and eastern boundaries of this area, the shore of Lake Turkana bounds it on the west, Kolom Asa bounds it on the northwest, and it is arbitrarily bounded by an east-west line on the north that separates it from Area 107. Strata in the area extend from very slightly below the KBS Tuff to slightly above the Orange Tuff, having an age range from ~1.9 to ~1.55 Ma.

Area 110 includes Bura Hasuma Hill. It is bounded by Il Derati on the south, by Il Alia on the west, and by the Koobi Fora Road on the east. Strata belong to the upper Burgi and KBS Mbs, with an age range from ~2.0 to 1.8 Ma.

Area 112 extends from the Koobi Fora Ridge Road on the northwest to the edge of exposures along Kolom Malbe in the northeast, where the boundary is an arbitrary line placed through a large area of surficial alluvium. The eastern boundary is along the divide between two branches of small tributary to Il Alia east of Kolom Malbe which join before reaching Il Alia. The southern boundary is the course of Il Alia, and the southwestern boundary follows a small unnamed tributary to Il Alia west of Kolom Malbe back to the Koobi Fora Ridge Road. In some early publications, this area is referred to as Area 105E (E for east). Strata in this area, though poorly exposed, belong to the KBS Mb, the Okote Mb, and the lower part of the Chari Mb, thus ranging in age from 1.86 to ~1.3 Ma.

Area 114 extends from its eastern boundary with Area 112 on the east to Il Alia on the south, to an unnamed northern tributary to Il Alia on the west, and through surficial deposits in an arbitrary line to the Koobi Fora Ridge road, which forms the northern boundary. Exposures are poor in this area and have been little investigated. Strata are believed to belong mainly to the KBS Mb, but may include some upper Burgi Mb.

Area 115 has its southeastern boundary at the Koobi Fora ridge Road, its western boundary along the old road (no longer in use) leading from points south to Ileret, and its northern boundary along Il Iriyamang'werr. A small, but important outcrop of the upper part of the lower Burgi Mb is exposed in the bottom of the channel of Il Iriyamang'werr, but the bulk of the strata belong to the upper Burgi Mb and the KBS Mb, ranging in age from ~2 to 1.7 Ma.

Area 116 is bounded on the north by Il Aberegaiye, on its northeast and east by a southern tributary to Il Aberegaiye and a northern tributary to Il Iriyamang'werr and the course of the latter stream. The southern boundary is placed across a broad area of alluvium to the old Ileret road (no longer in use, and barely visible in this region) back to Il Aberegaiye. Strata in this area belong to the upper part of the Tulu Bor Mb, the lower part of the lower Burgi Mb, and, above a disconformity, to the upper Burgi Mb. The upper part of the Tulu Bor Mb is exposed in the southern part of the area along Kolom Ninikaa. Strata below the disconformity have a probable age of 3.3 to 3.0 Ma; those above, a probable age of 2.0 to 1.9 Ma.

Area 117 is bounded on the south by Il Aberegaiye, on the west by the Kokoi Road, on the north by Il Naibar, and on the east along a line drawn through a region covered by alluvium. Strata belong principally to the Lonyumun, Lokochot, and Tulu Bor Mbs, but the easternmost part of the area contains strata of the upper Burgi Mb and the upper part of the KBS Mb. There is a large normal fault that brings Lonyumun, Moiti-Lokochot, and Tulu Bor sediments into close proximity with each other (Buchanan, 2010). Most fossils derive from above the Tulu Bor Tuff, and have a probable age range of 3.4 to ~2.9 Ma.

Area 118 is bounded on the southeast and east by the Koobi Fora Ridge Road, on the southwest by Il Aberegaiye, on the west by the edge of prominent outcrop (where it adjoins Area 117), and on the north by Il Naibar. Strata belong to the upper Burgi Mb, the KBS Mb, and the lower part of the Okote Mb, thus ranging in age from ~2 Ma to ~1.5 Ma.

Area 119 is bounded on the east by the Koobi Fora Road, on the south by Il Alia, on the west by Kolom Morte (also referred to as Il Morte), and on the north by the Koobi Fora Ridge Road. Strata belong to the upper KBS Mb and the lower part of the Okote Mb, with a probable age range of 1.7 to 1.45 Ma.

Area 120 is bounded by Il Alia on the west and along part of its northern extent. The boundary eastward follows Kolom Lua to a north-south line that extends to Kolom Guo in the south, and then follows Kolom Guo almost to its southern boundary, which lies along a small drainage that marks the northern limit of exposures of Area 123. Strata belong to the KBS Mb, 1.87-1.65 Ma.

Area 121 is a small, nearly square area bounded by Kolom Guo on the west and north, by an arbitrary N-S line on the east, and by an unnamed ephemeral stream on the south. Strata belong to the KBS Mb, ranging in age from ~1.9 to 1.65 Ma.

Area 123 is bounded on the south by Il Derati, on the west by the Koobi Fora Road, on the north by Il Alia and Kolom Guo, and by a NNW arbitrary line on the east. Strata belong principally to the upper Burgi and KBS Mbs, with the Lower Ileret Tuff being the youngest unit known. There has been some debate regarding the chronology of this area (Feibel et al., 2009; Gathogo and Brown, 2006), but it seems most fossils derive from strata ~1.9 to 1.6 Ma in age, i.e., KBS Mb.

Area 124 is bounded by the Koobi Fora Road on the west, the Koobi Fora Ridge Road on the north, and from there southward through surficial deposits to a northern tributary to Il Alia and along Il Alia. From 3.885° N, 36.334° E, the boundary follows a small streambed northward to the edge of outcrop, and then connects back to the Koobi Fora Road. Strata belong to the KBS Mb, 1.87-1.65 Ma.

Area 125 is bounded by Il Derati on the south, by an arbitrary line on the west, by Kolom Guo and a northern tributary of Kolom Guo for much of the northwest, by Kolom Lua on the north, and by the Derati-Ileret Road on the east. Miocene rhyolites are exposed in the eastern part of this area; Pliocene strata belong to the upper Burgi and KBS Mbs, and the highest levels may approximate the top of the KBS Mb. The age range is thus ~2.0 to ~1.65 Ma.

Area 127: Much of the southern border of this area is the course of Kolom Guo, and the western boundary is the arbitrary north-south line that separates it from Area 120; the northern boundary is Kolom Lua, and the eastern boundary extends across a small area of surficial deposits to a small northern tributary of Kolom Guo. Strata belong to the upper Burgi Mb and the KBS Mb, with the Malbe Tuff being near the highest level, giving a probable age range of ~2.0 to ~1.84 Ma.

Area 128 is bounded on the south by Kolom Lua, on the west and north by Il Alia, and on the east by an arbitrary border trending SSE from Il Alia to the Sabarei Junction Road and thence to Kolom Lua. Strata belong to the KBS, Okote, and Chari Mbs, ranging in age from ~1.87 to ~0.75 Ma.

Area 129 includes Pliocene strata exposed along Il Naitirwa. We have modified the eastern and northern boundaries slightly to include the northern Naitirwa drainage. The southern boundary of the area follows the Ileret Road; the western boundary is through an area covered by alluvium, and the northern boundary is placed within volcanic rocks to ensure inclusion of all Pliocene strata; its eastern boundary is the drainage divide between Il Naitirwa and Kolom Masich. Strata belong to the

Lonyumun, possibly the Moiti and Lokochot, the Tulu Bor, the upper Burgi, the KBS, and the lower part of the Okote Mbs. The age range is thus ~4.3 to 1.5 Ma.

Area 130 is bounded on the north and east by the Ileret Road, on the south by Il Kimire, and on the west by an arbitrary line drawn through an area of alluvial cover. Strata belong to the Tulu Bor, lower Burgi, upper Burgi, KBS, Okote, and the lower part of the Chari Mbs. The age range is thus ~3.4 to ~.75 Ma.

Area 131 is bounded on the north by Il Kimire, on the east by the Ileret Road and the Koobi Fora Ridge Road, on the south by Il Naibar, and on the west by the edge of prominent exposures. Strata belong to the upper Burgi Mb, the KBS Mb, the Okote Mb, and the lower part of the Chari Mb, thus ranging from ~2.0 to ~1.3 Ma.

Area 133 is bounded by the Ileret Road on the north, by the course of Il Alia on the east, and northward from Il Alia by an unnamed tributary to an alluvial plain back to the Koobi Fora Ridge road that marks the end of the area at the northern part of its western extent. Strata belong to the Lonyumun Mb, the Moiti Mb, the Lokochot Mb, the Tulu Bor Mb, and, above an erosion surface, the KBS Mb and Okote Mb, thus ranging in age from ~4.3 to 1.4 Ma. The Bench Tuff, exposed at archeological site FxJj63, was defined at Konso, Ethiopia, where it lies below the Bright White Tuff that is correlated with the Chari Tuff of the Koobi Fora Fm. Hence, the strata in this area lie in the uppermost part of the Okote Mb, so at least some parts of the Okote Mb are represented.

Area 134 is a narrow area at the eastern basin margin bisected by the Sabarei Junction Road and the eastern end of the Ileret road. Its western and northern margin are marked by Il Alia; its eastern margin by the limit of Pliocene or Pleistocene sedimentary outcrop, and its southern margin by the Sabarei Junction Road. Strata belong to the Moiti Mb, the Lokochot Mb, the upper Burgi Mb, the KBS Mb, the Okote Mb, and the Chari Mb. The age range is thus 4.3 to <0.75 Ma as the Silbo Tuff is also present.

Area 135 includes exposures along Kolom Masich. The southern boundary is placed along a minor road across an alluvial surface, and then at the drainage divide between Kolom Masich and other ephemeral drainages to the south. The western boundary is the divide between Il Naitirwa and Kolom Masich. The northwestern boundary is placed along the drainage divide between Il Warata and Kolom Masich or Chen Alia. No Pliocene or Pleistocene strata have been recorded in this area.

Area 136 is an area in which exposures are very low. It is bounded by Lake Turkana on the west, by a line extending from the lakeshore to the lower reaches of Il Naibar, then southward along the Kokoi Road to Aberegaiye. The boundary to the northeast goes along Il Aberegaiye and the old Ileret road where it bounds Area 116, across a patch of alluvial cover to Il Iriamang'werr, thence south-southwest to the northwestern tip of Area 104, and back to the lake along the northern borders of Areas 104, 100, 102 and 101. The Kokoi Road runs through its western extent. Strata in this area belong to the Lonyumun Mb, Lokochot Mb, the Tulu Bor Mb, the lower Burgi Mb, and the base of the upper Burgi Mb, with a corresponding age range of 4.3 to ~2.0 Ma.

Area 137 is a large area encompassing the Kokoi volcanic horst. It is bounded by a fault along the northwestern margin of the Kokoi, by Il Kimire in the northeast, along the western edge of Pliocene and Pleistocene strata in the East, and along Il Naibar in the south. Strata belong to the Lonyumun, Lokochot, and Tulu Bor Mbs, ranging in age from ~4.3 to 2.9 Ma.

Area 138: This large, low-lying area northwest of the Kokoi is bounded by Lake Turkana on the west, by the course of Il Kimire in the north, and by the fault along the Kokoi on the southeast. Strata belong Lonyumun, Lokochot, and Tulu Bor Mbs, and above a disconformity, to the Chari Mb. The older strata range in age from ~4.3 to ~3.1 Ma.

Area 139 lies northeast of the Kokoi and is bisected by the Ileret Road. Its northern boundary is formed by Il Warata and Il Naitirwa; its eastern boundary is placed through an area of alluvial cover up to Il Kimire, which forms its southern border.

Strata in this area belong to the Lonyumun, the Lokochot, the Tulu Bor, and the lower Burgi Mbs. The older strata range in age from ~4.3 to ~3.1 Ma, and the lower Burgi Mb up to about 2.6 Ma.

Allia Bay Region

Area 200 is bounded by the Derati Road on the south and east, by Il Burgi on southwest, and by Il Derati and Il Nya on the north. The area remains poorly investigated, but includes Lonyumun Mb strata resting on Miocene ash flows, the Moiti Tuff and the lower part of the Moiti Mb, and above a disconformity, strata tentatively identified as the upper part of the KBS Mb, and the lower part of the Okote Mb. The Lower Lokalalei and Burgi Tuffs have been identified at several places in the western part of this area. In sum, strata range from ~4.4 to ~1.5 Ma. Fossils from the area are difficult to place

stratigraphically and are derived from most likely lie in one of three time intervals: 4.4–3.9 Ma, or 2.7–2.5 Ma, or 1.9–1.4 Ma.

Area 201 is bounded by Il Ingumwai on the south and southwest, by the Derati Road on the northwest, and mainly by the old “Fora Water Hole” road on the east. Kubi Algi, made of Miocene ash flows (~13 Ma), lies within this area; exposures of strata that might be assigned to the Koobi Fora Fm are very limited.

Area 202 is bounded on the southeast by an ephemeral stream (unnamed) that separates it from Area 204, on the west by the limit of outcrop of the Koobi Fora Fm, and on the east by the old road (now unused) that led to Hasuma fossil forest (petrified logs). The northern boundary is the channel of Il Alia. Strata in this area include the Tulu Bor Mb above the Hasuma Tuff to slightly above the Burgi Tuff, thus ranging in age from ~2.8 to ~2.6 Ma. Williamson’s molluscan “Suregei Isolate” is best expressed in this area (Williamson, 1982; Williamson, 1985).

Area 203: This triangular area is bounded by the Derati Road on the south, by Il Ingumwai on the west, and by Il Burgi on the northeast. Strata in this area have proven quite difficult to place stratigraphically. It is reasonably certain that all strata in the area lie below the Burgi Tuff (2.63 Ma), but a lower boundary is more difficult to establish.

Area 204 is bounded by the limit of exposures of the Koobi Fora Fm on the south, by an unnamed ephemeral stream of medium size on the west and north, and by the drainage divide between Il Ingumwai and streams that drain to the west, the northern 2/3 of which coincide with the Koobi Fora Road. Strata in the area belong to the Lokochot and Tulu Bor Mbs of the Koobi Fora Fm. The Lokochot Tuff is the oldest known unit in the area, and the Hasuma Tuff (3.07 Ma) is the highest. This is the only area in which there is a nearly complete section between the Tulu Bor Tuff and the Hasuma Tuff. Most strata lie above the Tulu Bor Tuff, so most fossils from the area are in the age range from ~3.4 to ~3 Ma.

Area 205: Like Area 253, Area 205 is very low lying; it is bounded by Il Lokochot and an unnamed channel that extends to Lake Turkana on the southwest, by the lower course of Il Alia on the north, and by the beginning of outcrops of Koobi Fora Fm, on the northeast. The southeastern border is the Sibilo Park Road. It is probable that minor outcrops in this area belong to the Moiti and Lokochot or Tulu Bor Mbs.

Area 206 is bounded on the east by Area 204, and on the south, west, and north by Area 205. Strata in this area belong to the Lokochot Mb and to the lower part of the Tulu Bor Mb, ranging in age from ~3.5 Ma to ~3.1 Ma.

Area 207 is bounded by Il Toroto on the south and west, by Il Ingumwai on the north, and by a fault along much of the eastern limit. Strata in this area belong to the Tulu Bor and lower Burgi Mbs, ranging in age from the Tulu Bor Tuff to the Lokalelei Tuff, thus spanning 3.4 to 2.55 Ma.

Area 209 is bounded by the Derati Road on the south, by the drainage divide between Il Ingumwai and westward draining streams on the west, by a low, seasonally inundated area on the north, and by Il Ingumwai on the east. It is bisected by the Koobi Fora Road. Very minor exposures of Pliocene rocks are present in this area along the western side of Il Ingumwai, most likely belonging to the upper part of the Tulu Bor Mb.

Area 210: The original extent of this area was retained, but east of ~36.48°E no strata of the Koobi Fora Fm are known. The southern boundary is Il Nya, the northern boundary is Il Derati, and the eastern boundary is the Derati Road. There has been little investigation of this area. The Lokochot Tuff (3.56 Ma) and Toroto Tuff (3.32 Ma) have been identified in the western part of the area; it is probable that these are disconformably overlain by strata of the upper Burgi Mb, but the age of the youngest strata is not known.

Area 212 is bounded by Il Lokochot on the south, by the Derati Road on the northwest, by Il Ingumwai and Il Toroto on the northeast, and by the limit of sedimentary strata on the east. Strata in this area belong to the Lonyumun, Moiti, Lokochot, and Tulu Bor Mbs, becoming progressive younger to the north, such that the Lonyumun Mb is confined to exposures along Il Lokochot, and deposits of the Lokochot and Tulu Bor Mbs are exposed in tributaries to Il Ingumwai. The Toroto Tuff (3.33 Ma) is relatively widely exposed. The age range is from ~4.1 Ma to 3.1 Ma.

Area 250: Roughly triangular in shape, this area is bounded by the Park Road on the southeast, by Il Lokochot on the north, and by the limit of Pliocene outcrop along the west. Strata belong to the Moiti and Lokochot Mbs, but the Tulu Bor Tuff is also present in the western part of the exposures. The age range is thus ~4 to 3.4 Ma.

Area 251, a small area, is bounded by Area 252 on the south, by the Park Road on the northwest, by Il Lokochot on the northwest, and by Il Lonyumun on the east. Strata in this area belong to the Lonyumun, Moiti, and Lokochot Mbs, thus ranging in age from ~4.4 to ~3.5 Ma.

Area 252: The southwest border of this area is the Allia Bay-North Horr Road. The western boundary is formed by Il Lonyumun and a tributary to it. The northern boundary is formed by the main channel of Il Lokochot, and the eastern boundary is arbitrarily placed to include Pliocene sedimentary strata along a boundary that trends NNE. Strata within this area belong to the Lonyumun Mb, with a small extent of strata in the Lokochot Mb. Most strata lie below the Moiti Tuff (3.97 Ma), but strata up to 3.6 Ma (the Lokochot Tuff) are also present. “Snail Hill”, which preserves a shellbed intruded by Gombe Basalt Dikes, lies within this area. Garma Tochu, a high area in the southern part of this area may be an eruptive center of the Gombe Basalts.

Area 253: This low-lying area is bounded on the south by the Park Road, on the east by Area 250, and on the north by Il Lokochot and an unnamed channel that extends to Lake Turkana. The western boundary is the shore of Lake Turkana. Pliocene outcrops in this area, if any, are of minor extent.

Area 254: The southwest border of this area is common with the northeast border of Area 260. The northern border is placed at the road from the Kenya Wildlife Service Headquarters at Allia Bay to the interior of Sibiloi National Park as far east as 36.3307°E longitude where the boundary with Area 251 extends to the southeast north of Sibiloi Mountain, and then curves to the northeast until it reaches Il Lonyumun. The eastern border is formed by the principal north-south trending channel of Il Lonyumun, and then by a tributary to Il Lonyumun that reaches the Allia Bay-North Horr Road. Miocene ash flow tuffs ~13.1 Ma and basalts are exposed on Sibiloi Mountain, the site of the “Petrified Forest.” Pliocene strata are principally of the Lonyumun Mb below the Moiti Tuff. Thus the age range is ~4.4 to 4.0 Ma.

Area 260 is the southeastern-most of the paleontological collection areas. Like Area 261, it is arbitrarily bounded at latitude 3.5158°N on the south, by the Allia Bay-North Horr road from the southeasternmost point to the Karsa Gate Junction with the old road to KWS Headquarters at Allia Bay, and the boundary then follows the old road to the KWS Headquarters which follows the drainage divide between Il Moiti and Nyongololong’atuk west of the Nyongololong’atuk crossing. The northwest border is formed by the shore of Lake Turkana. As with Area 261, strata range from the

Lonyumun Mb to slightly above the Tulu Bor Tuff at the base of the Tulu Bor Mb, an age range of ~4.4 to 3.4 Ma.

Area 261 is the southwestern-most of the paleontological collection areas. It is bounded (arbitrarily) at latitude 3.5158°N on the south, by the shore of Lake Turkana on the west and north, and by Il Moiti on the east where it adjoins Area 260. Strata range from the Lonyumun Mb to slightly above the Tulu Bor Tuff at the base of the Tulu Bor Mb, an age range of ~4.4 to 3.4 Ma. Much of the highland of Jarigole in this area is covered by Gombe Basalts (~4 Ma old), some of which are intrusive into Lonyumun Mb strata on the west flank of Jarigole.

Loiyangalani Region

Sediments of the Koobi Fora Fm are also found in the Loiyangalani region southeast of Lake Turkana. These sedimentary exposures are not assigned to formal Paleontological Collecting Areas, but they include the Lonyumun, Moiti-Lokochot, Tulu Bor, Burgi, and KBS Mbs (Gathogo et al., 2008). Although there are vertebrate fossils in the Loiyangalani region, these have not been described in any detail, and they appear to be sparse.

Thus, fossil vertebrates are unevenly distributed across the Koobi Fora Paleontological Collection Areas described above. Area 103 near the Koobi Fora base camp and areas 130 and 105 have the highest documented abundance of fossils. The highest density of fossils occurs in two of the smallest collecting areas: Area 1 and Area 1A. These areas are about 1 km², and both have large faunal samples. Some areas remain poorly sampled or have a sparse record.