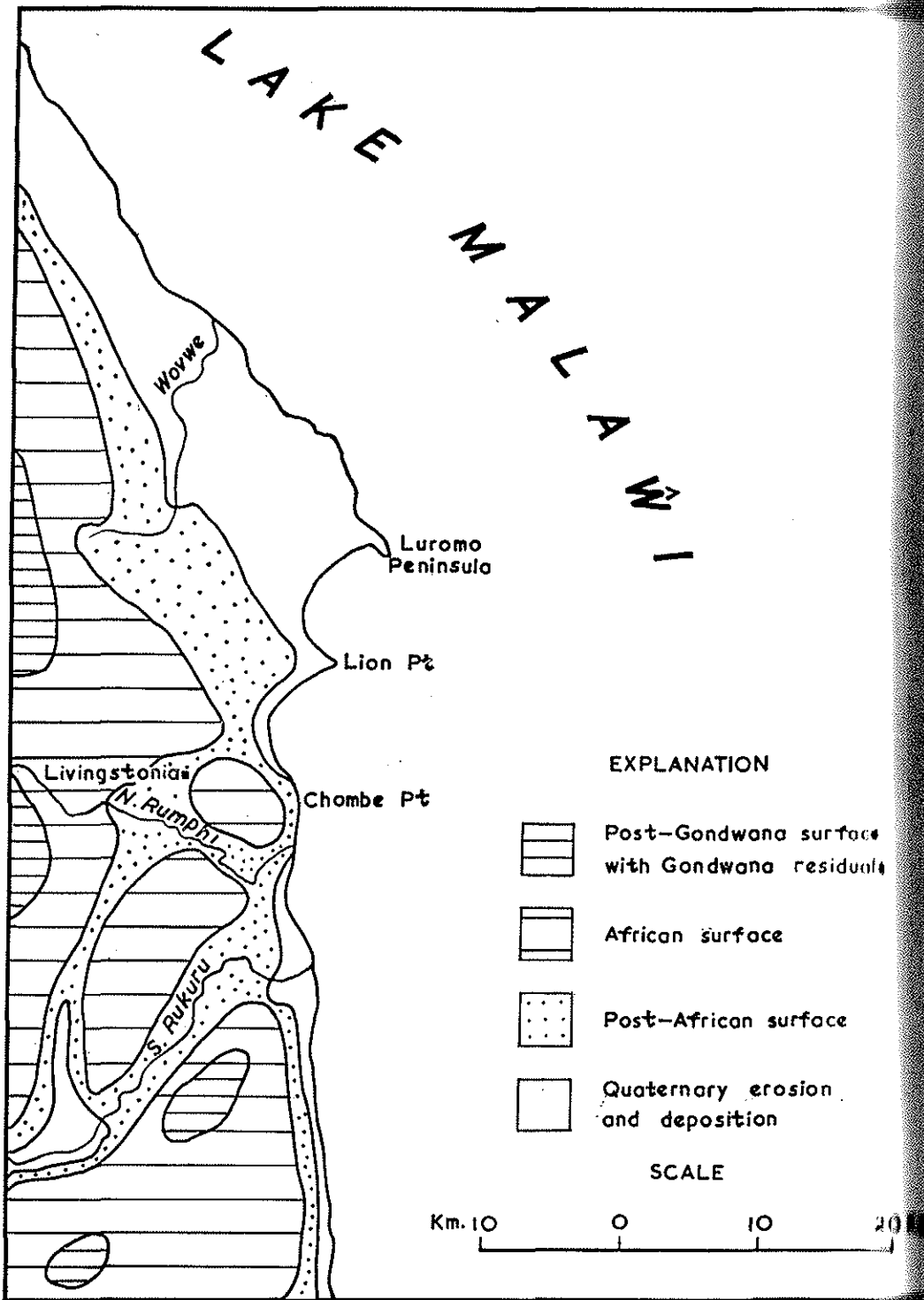


THE GEOLOGY
OF THE
UZUMARA AREA

by
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FIG. 3. Erosion surfaces in the Uzumara area.

II. PHYSIOGRAPHY

(a) Relief

The area is one of high relief, with levels ranging from 474 m at the shore of Lake Malaŵi to 2425 m at the crest of the eastern escarpment of the Nyika Plateau. It can be conveniently divided for descriptive purposes into the nine topographical units shown in Figure 2.

A prominent feature is the edge of the Nyika Plateau in the central part of the west side of the area, grading northwards into the dissected high country of the North Nyika Foot-hills. Immediately east of these features and extending along most of the western margin of the area the East Nyika Escarpment merges northwards with the South Karonga Scarp Zone. The larger rivers draining the Plateau and northern highlands have cut gorges through these escarpments and the smaller consequent streams flow in deeply incised courses many of which include waterfalls.

In the south, the escarpment falls steeply to the Henga Valley through which the South Rukuru River flows north-eastwards. Beyond this river the high Uzumara Plateau, rising to 1942 m at Uzumara Hill, represents the northern continuation of the dissected plateau of the North Viphya Mountains. A further continuation of this highland mass lies north of the South Rukuru River in the form of the Livingstonia Hills which abut westwards against the loftier East Nyika Escarpment. The nearly horizontal Karroo rocks which form these hills give them a flat-topped terraced appearance (Plate IIA). Their highest point is Chombe Hill with a height of 1372 m.

From the southern limit of the area northwards to the Chitimba River the lakeside is flanked by a steep escarpment (Plate IIA and B) with practically no littoral except at river mouths. The northern end of this feature, near Livingstonia, is referred to later in this account as the Livingstonia Escarpment (Plate IIB).

The Lakeshore Plain is an extensive region of plainland, swamp and low hill ridges of north-north-westerly trend which exceed 600 metres in altitude at only a few scattered points.

(b) Drainage

The largest river in the area is the South Rukuru, which draws its flow from the Mzimba Plain and south Nyika Plateau, far beyond the limits of the area presently described, and is probably the only representative of the 'plateau' system of drainage, established prior to the formation of the rift valley (Pike and Rimmington 1965). Most of the others are consequent rivers, draining the eastern sides of the Nyika Plateau and North Nyika Foot-hills, and the corresponding escarpment zones. The main rivers in this category are the Remero, Bumba, Chonanga, Hara, Chitimba, Kaziwiziwi, North Rumphu, Kambwiya and Chivungulu (Plate I). The Uzumaru Plateau is drained by a number of consequent rivers and streams with north-easterly courses, notably the Chisanga and Uwera.

(c) Geomorphology

According to Lister (1967) the geomorphology of the area reflects the influence of successive periods of rift faulting on the land forms developed during the major erosion cycles which affected this part of Africa (Fig. 3).

The earliest surface which can be recognized is the 'Gondwana' (Jurassic)

surface (King 1963) which appears in the form of residuals on the 'post-Gondwana' (early- and mid-Cretaceous) surface developed on the margin of the Nyika Plateau at the western edge of the area. Lister (*op. cit.* p. 16) observes: 'these two erosion surfaces can be clearly distinguished on the eastern edge of the plateau where the post-Gondwana cycle forms the broad saddles which cut into the higher Gondwana portions of the skyline seen to the west of the Rumphii-Livingstonia road'. The post-Gondwana surface is also represented by a few residuals on the Uzumara Plateau, notably on Uzumara and Ngunikira Hills.

The 'African' (late-Cretaceous to early-Miocene) peneplanation is represented by the concordant flat summits of the Livingstonia Hills and the Uzumara Plateau. The major incised river courses draining the Nyika Plateau and Foot-hills also date from this time.

'Post-African' (late-Miocene and Pliocene) erosion was promoted by the down-faulting of a portion of the African surface along the line of the present lakeshore in the southern part of the area and along the western limits of the Lakeshore Plain in the northern part. The Henga Valley is a product of this cycle which cut valley floors to a depth of about 100 m in the African surface of the Livingstonia and Uzumara Plateau areas.

Following renewed lowering of the base-level of erosion by further rift movements, the Quaternary (late-Pliocene to present) cycle, besides initiating its own consequent streams, has deepened the post-African river courses, working upstream from the river mouths. Slow movements have enabled early stream courses in sedimentary formations to cut through transverse ridges of gneiss instead of undergoing deflection. For example the Chonanga River cuts through a faulted block of crystalline rocks just west of the Hara Plain. The Lakeshore Plain is the site of much Quaternary erosion of the older lacustrine formations and extensive deposition of alluvium.

(d) Climate

The high relief of the area causes the climate to vary within short distances. The mean annual temperature is closely related to altitude. Along most of the Lakeshore it lies between 21°C and 24°C; at Livingstonia and along the escarpment zones at about the same altitude it is 18°C to 21°C; in the Uzumara Plateau area it falls to 15,6°C to 18°C; and on the edge of the Nyika Plateau it is around 15°C. The November mean maximum is generally over 26,7°C, rising to as much as 33°C on the Lakeshore. The July mean minimum varies from 4,4°C to 7,2°C in the higher areas to over 13°C on the Lakeshore.

The rainfall distribution is controlled mainly by the relation of the relief features to the moisture-laden easterly and south-easterly winds of October to May. Thus the Lakeshore Escarpment and East Nyika Escarpment receive between 1440 mm and 1850 mm of rainfall annually. The Henga Valley, in the rain shadow of the Uzumara Plateau, receives 820 mm to 1030 mm while the Lakeshore Plain, which is elongated parallel to the course of the prevailing winds, receives only 635 mm to 760 mm.

(e) Vegetation

At the highest altitudes in the area, on the Nyika and Uzumara Plateaux, mountain grassland is prevalent, with patches of montane evergreen forest at valley heads (Young and Brown 1962; Pike and Rimmington 1965).

In the escarpment areas, over much of the Uzumara Plateau and in the Livingstonia Hills, the dominant vegetation is *Brachystegia* woodland which appears in a variety of community types depending on the rainfall and soil type.

In the Henga Valley, *Acacia* cultivation savannah occurs, with small areas of *Acacia-Combretum* thicket.

Follow-up investigation of the results of the survey is in progress at the time of going to press.

(g) Hot springs

To the west of North Chiweta Village, near the mouth of the North Kumpoti River, a line of hot springs marks the outcrop of the fault which limits the patch of Chiweta Beds on its southwest side. Kirkpatrick (1969) records that their maximum temperature is 78,3°C and that the temperature falls after rainfall. The springs emit steam and sulphurous gas and deposit white incrustations on nearby rocks. Analysis of the water showed 1198 mg/l of total solids, consisting largely of sodium carbonate and sodium chloride. At 20 mg/l the fluorine content is high compared to that of other hot springs in the country.

TABLE VII

BOREHOLES DRILLED FOR WATER SUPPLY IN THE
UZUMARA AREA UP TO MAY 1974

Ref. No.	Locality	Grid reference	Depth (m) (ft)	Yield (g.p.h.)	Year drilled
A137	Mvula	XD 354466	9 28	not known*	1961
A139	Ponda	XD 350476	38 126	not known*	1961
A143	Mlale	XD 115745	12 38	not known*	1961
A301	Phurano	XD 319369	16 54	not known*	1961
A303	Lipwelabulamba	XD 315446	17 56	not known*	1961
A306	Lumpangala	XD 207594	16 52	not known*	1961
A308	Zayoni	XD 241658	9 30	not known*	1961
A309	Lamelo School	XD 161751	17 55	not known*	1961
DP171	Mwamatandala	XD 331529	53 175	480	1971
DP172	Mtema	XD 336463	55 180	310	1971
E181	Mzokoto	XC 126943	45 148	1080	1970
GK52	Zomba	XD 142743	46 152	480	1971
GK53	Bangamoyo	XD 158745	48 156	600	1971
GK54	Ngara dip tank	XD 196706	67 220	300	1971
GK55	Mbuyu	XD 181612	40 130	620	1971
GK108	Nyungwe Dispensary	XD 205657	56 185	620	1971
Q131	Kahonoko	XD 097017	34 112	480	1960
Q132	Chavungulu	XC 013993	40 131	500	1960
Q138	Chilumba Sec. Sch.	XD 351470	32 106	500	1960
Q386	Mlale	WD 131764	34 110	650	1960
Q387	Uliwa	XD 327445	46 152	800	1960
Q388	Hara Agric. Stn.	XD 271399	40 131	1000	1960
R202	Hara Agric. Stn.	XD 256408	53 175	1000	1970
R203	Chilumba F.T.C.	XD 326477	60 196	750	1970
R204	Wovwe Scheme	XD 221563	47 153	1000	1970
R210	Chilumba Mission	XD 325492	91 300	600	1970
W76	Mwambelo	XD 142758	34 111	900	1970
W165	Chilumba Mission	XD 328489	90 295	900	1970
W222	Mwakabanga	XD 118777	32 105	528	1961
W223	Nyungwe Ct.	XD 214633	41 135	900	1960
W224	Mwantawali	XD 323446	51 168	600	1960
W234	Wundaninge	XD 300570	44 145	1200	1960
W235	Mwaungulu	XD 344481	79 260	900	1960
W258	Chibeleke	XC 119916	52 170	264	1961

Depth in metres calculated to nearest whole metre.

* Not measured: drilled by hand rig.

(h) Water supplies

The flow of the South Rukuru and North Rumphi Rivers is maintained throughout the year by perennial streams flowing off the Nyika Plateau. Several rivers draining the Uzumara Plateau are also perennial. Rivers crossing the Lakeshore Plain however, such as the Nyungwe and Woywe, although receiving perennial flow in their higher reaches, lose too much water in the sedimentary formations to maintain their flow throughout the year. There is thus a general need for supplementary supplies of water from underground sources in the more populous parts of the lowlands, notably the area immediately west of Chilumba, the lower Woywe Valley, and the lakeshore strip around the mouth of the Remero River. The 34 boreholes drilled in the area by the Geological Survey Department up to May 1974, with an average depth of 43 m, give moderately good yields, generally from sedimentary aquifers. Their locations are shown on the accompanying geological maps and details of each hole are given in Table VII.