

THE SCALES OF SOME AFRICAN MUSICAL INSTRUMENTS

(As measured in the field at the time of recording¹)

The means of pitch measurement employed was by comparing unisons against a set of fifty-four scientifically made tuning forks, (supplied by W. Ragg & Co. of Sheffield, England) ranging from 212-424 vs., the difference between each fork being 4 vs. Each note on the African instrument concerned was sounded separately and compared for pitch with its nearest tuning fork or, where necessary, against its octave. This gives the observer a theoretical accuracy of plus/minus 2 vs. in the middle register which, at the lower end of the set, is equal to one sixth of a tempered semitone (c. 16 cents) and at the upper end one twelfth (c. 9 cents). As the tuning of instruments is done by an African player through his innate psychophysical senses with no reference to a fixed physical norm or mathematically determined pitch, this degree of accuracy should be enough to give a reasonable indication of the approximate ideal scale toward which the musician was striving or, alternatively, the degree of tolerance which he was prepared to accept for his cultural purpose.

The fact that within several local communities the tuning of instruments of the same class shows remarkable concordance, would indicate that there may yet be found a number of ideal tunings or scales for each of the several groups in Central and Southern Africa. It is too early and too doctrinaire to expect greater accuracy at this period of time. The need for greater unanimity in tuning will be necessary only when much closer social contact is the rule between the different groups than in fact occurs today (1973). The mechanical transmission of music by radio and records may either hasten the process or confuse the issue.

Slight inaccuracy of tuning is always a possibility as the tone sensibility of musicians varies. However, my experience of African music has convinced me that if reasonably accurate measurement of the various African scales were made, particularly those on instruments of fixed pitch such as the xylophone and mbira (plucked reed) families, that an awareness of relative pitch would eventually evolve amongst African folk musicians who might then take the necessary steps to determine an acceptable musical consensus of scales for any one community. At present it seems clear that no African scale can be considered to be an approximation of the western tempered scale, and striving to acquire this foreign scale succeeds only in destroying or partially deflecting the natural modality which so greatly adds to the musicality of authentic African compositions. This may not be understood by musical Philistines but is self-evident to sensitive musicians and composers.

It will be of interest to those who question the accuracy of the use of a set of tuning forks to note that the student, whoever he may be, has only to judge *unisons* not *intervals* which are liable to subjective distortion - the agreement of the note whose pitch

Footnote: 1 See the year of recording noted against each item in Volume II.

he is measuring against the nearest tuning fork. He can also, as a rule, ask the African musician with whom he is working to check the accuracy of his unisons by indicating which tuning fork he himself prefers for each pitch. Most of the scales presented here have been checked with the player in this manner.

It will also be borne in mind that too great a degree of accuracy in measurement of pitch may in itself be misleading, as all musical scales are subject to pitch tolerances rather than exactitudes, (e.g. the vibrato employed by Western violinists). Measuring the apparent pitch of a note to an accuracy of several decimal points by means of an electric stroboscope may be scientifically correct but largely irrelevant in the present circumstance: where acceptable degrees of local pitch fluctuations and tolerances have not yet been culturally ascertained. The scales set out here are an indication of what I found in the homes of the many instrumentalists at that time, and as such, may form a point of reference hitherto unavailable to musicians and musicologists. In general terms they indicate clearly whether the instruments are normally pentatonic, hexatonic or heptatonic, and to what extent if any, they are influenced by the harmonic series. Other conjectures will require several years of field work to substantiate or refute, and, for the moment, this chapter reflects, without prejudice or hypothesis, only a part of one man's firsthand factual evidence.

Visual Octave Scale

In order to comprehend the significance of vibration numbers, both as a scale within an octave and also the size of the several intervals employed, it is advisable to set out each scale in graph form.

The pitch of each note in vibrations per second is converted into its logarithmic code number according to the Cents System in which 100 cents represent one tempered semitone (Diagram I). The position of each note within the octave can then be plotted diagrammatically, (Diagram II). This makes it possible to make direct comparisons between various scales regardless of the pitch of the tonic or accepted starting point.

Where the identity of the tonic is not certain, the scale from any alternative starting point can be readily assessed as the consecutive relationship between the notes of the scale remains progressively constant.

Visual Interval Scale

The smaller diagram below each scale 'ladder' represents the comparative sizes of the intervals in sequence within the octave.

It will be remembered that many African instrumentalists think of their scales in descending rather than ascending order, or may not conceive of a regular order of notes at

all in terms of pitch direction, but in some other sequences which, to them, seem equally logical. This diagram enables the student to see at a glance the comparative size of the intervals and observe their preferences at any point in the scale. It is evident, for example, from these random examples that none has an interval as small as a tempered semitone, and that the Chopi scale is nearly equitonal.

Visual evidence of this nature may offset the strong tendency of non-African observers to rely upon subjective judgements which are firmly founded upon cultural prejudices both in musical styles and in scales.

DIAGRAM I

TR-207 (B-4) Chopi				TR-36 (B-1) Luvale/Lwena				TR-140 (A-6) Soga			
MEASUREMENT OF SCALE:				MEASUREMENT OF SCALE:				MEASUREMENT OF SCALE:			
Notes in v.p.s.	Code No.	Intervals in Cents	Progressive Intervals in Cents	Notes in v.p.s.	Code No.	Intervals in Cents	Progressive Intervals in Cents	Notes in v.p.s.	Code No.	Intervals in Cents	Progressive Intervals in Cents
496	654		1200	-	-		-	-	-		-
448	477	177	1023	488	625	-	1200	-	-		-
404	298	179	844	416	349	276	924	656	1137	-	1200
364	118	180	664	376	174	175	749	560	863	274	926
328	1137	181	483	336	1179	195	554	496	654	209	717
296	960	177	306	312	1051	128	426	432	414	240	477
272	813	147	159	268	788	263	163	368	136	278	199
248	654	159	0	244	625	163	0	328	1137	199	0

DIAGRAM II

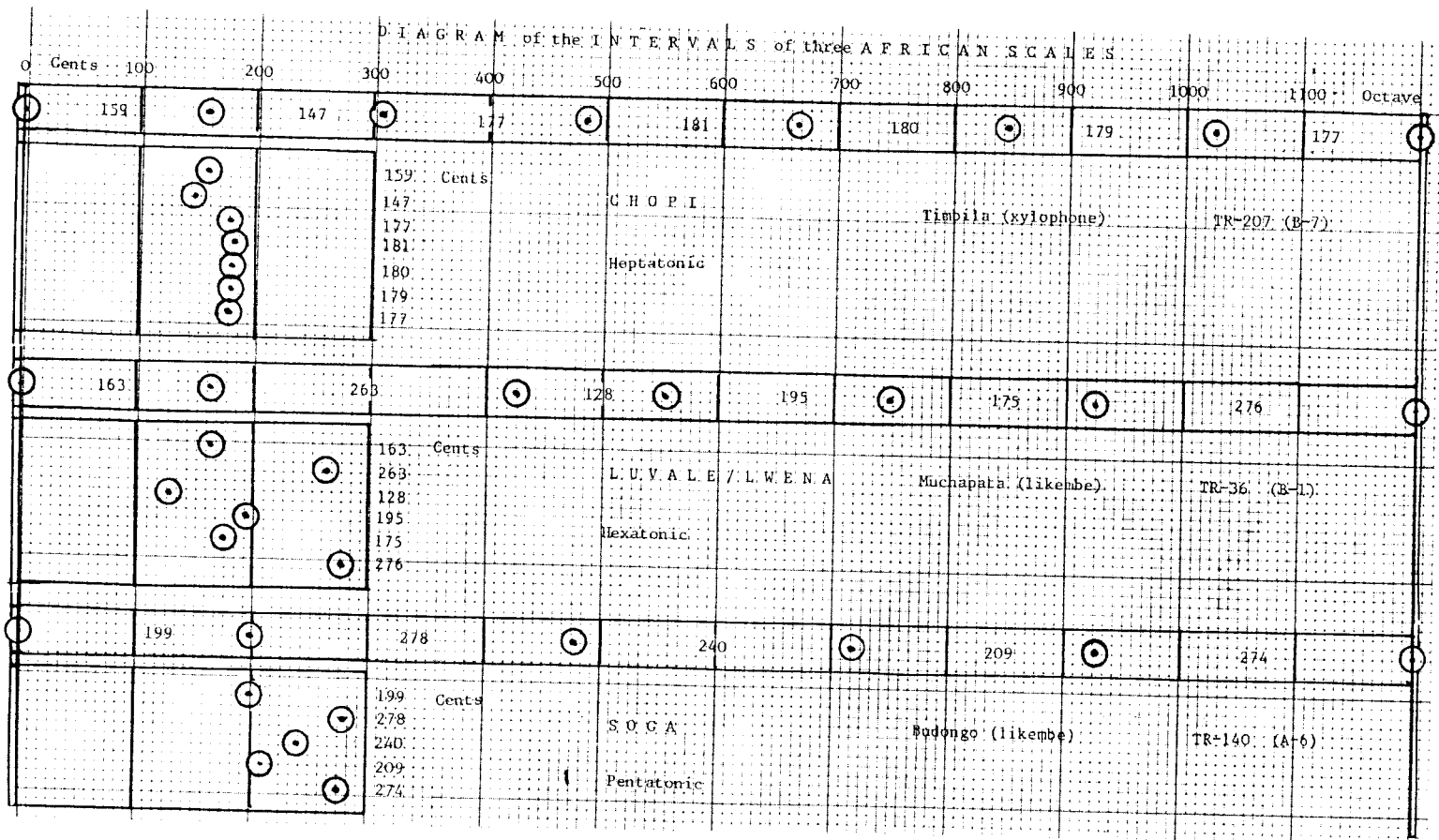


TABLE OF CENTS

To convert an interval between two notes expressed in vibrations per second to cents.

(100 cents = 1 tempered semitone. 1200 cents = 1 octave.)

The code number will be found in the appropriate digit column opposite the line showing the Hundreds and Tens. Subtract the smaller from the greater code number to find the result in cents.

170—340 VIBRATIONS PER SECOND

	0	1	2	3	4	5	6	7	8	9	
17	0	10	20	30	40	50	60	69	79	89	17
18	98	108	118	127	136	146	155	164	174	183	18
19	192	201	210	219	228	237	246	255	263	272	19
20	281	289	298	306	315	324	332	340	349	357	20
21	365	373	382	390	398	406	414	422	430	438	21
22	446	454	462	469	477	485	492	500	508	516	22
23	523	530	538	546	553	560	567	575	582	589	23
24	596	604	611	618	625	632	640	646	654	660	24
25	667	674	681	688	695	702	708	715	722	728	25
26	735	742	748	755	761	768	774	781	788	794	26
27	800	807	813	820	826	832	838	845	851	857	27
28	863	869	876	882	888	894	900	906	912	918	28
29	924	930	936	942	948	954	960	965	971	977	29
30	983	988	994	1000	1006	1011	1017	1023	1028	1034	30
31	1040	1045	1051	1056	1062	1067	1072	1078	1084	1089	31
32	1094	1100	1105	1110	1116	1121	1126	1132	1137	1142	32
33	1148	1153	1158	1163	1168	1174	1179	1184	1189	1194	33
34	1200										
	0	1	2	3	4	5	6	7	8	9	

SCALES OF SOME AFRICAN INSTRUMENTS RECORDED IN THIS SERIES

C H O R D O P H O N E S String Instruments

- 10.1- MUSICAL BOW The stick is flexible and may be of round, half round or flat section. It is usually played by plucking.
- 10.1022- Round section, no resonator, braced string, plucked.
- | | | | |
|------------------|--|---------------|--------------|
| <u>maringisa</u> | | <u>Tsonga</u> | |
| 142 166 vs | | | TR-193 (B-8) |
| 270 cents | | | |
- 10.111 x 3- Round section, separate resonator, plucked.
- | | | | |
|---------------------|--|--------------------|----------------|
| <u>ekinongo</u> x 3 | | <u>Nyoro/Nkole</u> | |
| 364 292 198 vs | | | TR-134 (B-1,2) |
| 673 - 382 cents | | | |
- 10.121- Round section, resonator attached, vertical open string, struck.
- | | | | |
|---------------------|--|----------------------|-------------------|
| <u>hadi</u> (uHadi) | | <u>Xhosa/Gcaleka</u> | |
| 260 288 vs | | | TR-28 (A-3,4,5,6) |
| 177 cents | | | |
- ditto-
- | | | | |
|------------|--|--|-------------|
| | | | |
| 276 308 vs | | | TR-63 (B-8) |
| 190 cents | | | |
- | | | | |
|---------------|--|--------------|-------------|
| <u>ligubu</u> | | <u>Swati</u> | |
| 240 260 vs | | | TR-72 (B-8) |
| 139 cents | | | |
- 10.122- Round section, resonator attached, vertical, braced, struck.
- - -
- | | | | |
|------------|--|--------------|-------------|
| | | <u>Rundi</u> | |
| 288 720 vs | | | TR-58 (A-9) |
| 1586 cents | | | |
- | | | | |
|--------------------------------|--|---------------------|-------------|
| <u>kalumbo</u> (with mirliton) | | <u>Valley Tonga</u> | |
| 228 416 vs | | | TR-41 (A-2) |
| 1041 cents | | | TR-42 (B-3) |
- | | | | |
|-------------------|--|-------------|-------------------|
| <u>makhweyana</u> | | <u>Zulu</u> | |
| 160 182 vs | | | TR-10 (B-3,4,5,6) |
| 224 cents | | | |
- ditto-
- | | | | |
|------------|--|--------------|---------------|
| | | <u>Swati</u> | |
| 288 340 vs | | | TR-72 (B-1,2) |
| 288 cents | | | |
- ditto-
- | | | | |
|------------------------|--|--|-------------|
| | | | |
| 288 340 364 stopped vs | | | TR-72 (B-3) |
| 288 - 118 cents | | | |
- ditto-
- | | | | |
|------------|--|--|---------------|
| | | | |
| 180 200 vs | | | TR-72 (B-4,5) |
| 183 cents | | | |

Scales of some instruments (cont'd)

- 10.1311- Mouth resonated, open string, plucked.
ikinki
 260 292 vs Xhosa/Gcaleka TR-63 (B-2,3)
 201 cents
- 10.171- Half round section, resonator attached, open string vertical, struck.
ugubu
 228 252 vs Zulu TR-10 (B-1,2)
 173 cents
- 10.3- ZITHER An instrument in which the strings are attached from end to end of the resonating body.
- 10.32 x 7- Experimental, on guitar type resonator, plucked.
bangwe m'kulu x 7
 212 236 276 288 324 364 388 Yao vs TR-66 (B-6)
 185 - 271 - 74 - 204 - 202 - 110 cents
- 10.3515 x 5- Trough zither, extra resonator, plucked.
malimba
 63 76 84 90 103 vs Gogo TR-154 (B-2,3)
 325 - 173 - 111 - 242 cents
- 10.3716 x 8- Zither, shallow trough, plucked.
inanga
 68 85 93 105 116 136 vs Rundi TR-58 (B-6)
 437 - 105 - 210 - 173 - 275 cents
- ditto-
 81 101 122 136 150 162 vs Rwandi TR-58 (B-1,2)
 382 - 327 - 188 - 170 - 133 cents
- 10.3817 x 7- Zither, shallow trough, extra resonator, plucked.
nanga
 93 101 105 118 126 136 152 Nyoro/Haya TR-145 (A-3)
 143 - 67 - 202 - 114 - 132 - 193 cents
- ditto-
 106 124 136 144 160 176 vs TR-145 (B-1,2,3)
 272 - 159 - 99 - 182 - 166 cents
- ditto-
 140 152 176 192 210 232 256 vs TR-146 (A-1)
 143 - 254 - 150 - 155 - 173 - 170 cents
- 10.4- BOARD OR RAFT ZITHER Strings stretched lengthways over a board or raft.
- 10.41 x 7- Board zither without resonator, plucked.
bangwe
 140 156 176 210 232 260 280 Tumbuka/Henga TR-189 (B-4)
 188 - 209 - 305 - 173 - 197 - 128 cents

Scales of some instruments (cont'd)

- 10.41- bangwe 150 162 184 224 256 300 vs Tonga TR-37 (A-1,2,3)
133 - 220 - 341 - 231 - 275 cents
- 10.43- Board zither, with resonator, plucked.
- pango x 7 166 198 212 252 296 332 vs Nyakyusa TR-158 (A-9,10,11)
205 - 119 - 299 - 279 - 198 cents
- bango x 7 140 156 178 198 216 236 256 vs Tumbuka/Henga TR-189 (A-3,4,5,6)
188 - 228 - 184 - 151 - 153 - 141 cents
- bangwe x 7 196 220 248 272 308 344 392 vs Nyanja/Mang'anja TR-88 (B-1,2)
200 - 208 - 159 - 215 - 192 - 226 cents
- ditto- x 11 304 336 372 408 448 496 544 vs TR-88 (B-3,4)
173 - 176 - 160 - 162 - 177 - 159 cents
- ditto- x 7 312 352 388 464 520 624 704 vs TR-88 (B-5,6)
209 - 168 - 310 - 197 - 316 cents
- ditto- x 6 432 488 520 576 616 656 vs Nyanja/Chewa TR-92 (A-2,3)
211 - 110 - 177 - 116 - 109 cents
- ditto- x 7 244 276 308 340 368 408 432 vs TR-92 (A-7,8)
213 - 190 - 172 - 136 - 179 - 99 cents
- ditto- x 7 304 324 380 416 456 488 vs TR-92 (B-5,6)
110 - 276 - 157 - 159 - 117 cents
- ditto- x 7 200 284 312 332 368 380 400 vs TR-94 (b-1,2)
607 - 163 - 107 - 178 - 56 - 89 cents
- ditto- x 11 206 224 248 272 308 336 372 vs Sena/Tonga TR-91 (B-7)
412 448 496 544 vs
215 - 151 - 176 - 177 - 145 - 177 - 159 cents
- ditto- x 7 300 324 352 388 416 440 464 vs Zulu/Ngoni TR-84 (A-8,9)
133 - 144 - 168 - 121 - 97 - 92 cents
- seki x 5 154 194 232 284 vs Mombutu TR-119 (B-1,2)
400 - 310 - 350 cents

-10.6- LYRES

-10.6116- Box Lyre, laced.

- itungu x 7 208 232 248 268 304 352 416 vs Luyia/Ragoli TR-162 (A-6)
189 - 116 - 134 - 218 - 254 - 289 cents

Scales of some instruments (cont'd)

-10.62- Bowl Lyre

endongo x 8
 224 264 296 340 404 448 528 Ganda
 284 - 199 - 240 - 298 - 179 592 vs TR-136 (B-1,2)
 cents

ntongoli x 8
 101 110 130 144 174 202 220 Soga
 148 - 289 - 177 - 329 - 258 248 vs TR-142 (A-2,3,4,5)
 cents

thum x 8
 116 138 152 170 202 232 vs Luo TR-168 (B-5,6)
 300 - 168 - 194 - 298 - 240 cents

kipukandet x 5
 180 206 232 256 308 vs Nandi TR-164 (A-2,3,4)
 234 - 206 - 170 - 320 cents

ketuba x 8
 120 138 162 184 212 240 vs Kipsigis TR-165 (B-5)
 242 - 278 - 220 - 246 - 214 cents

-10.64- Frame Lyre, wishbone shaped with external resonator.

chepkesem x 5
 188 220 240 268 316 vs Kipsigis TR-165 (B-4)
 272 - 150 - 192 - 284 cents

-10.7- HARP

-10.71- Bow Harp, vertical.

kundi x 5
 220 240 288 324 352 vs Zande/Bandiya TR-122 (A-5,6,7)
 315 - 316 - 204 - 144 cents

-ditto-
 194 224 236 300 336 vs TR-122 (B-2,3)
 249 - 90 - 416 - 196 cents

-ditto-
 188 210 220 284 312 vs
 191 - 81 - 442 - 163 cents

-ditto-
 194 216 224 284 320 vs
 186 - 63 - 411 - 206 cents

-10.73- Bow Harp, horizontal.

ekidongo x 8
 120 142 161 180 208 240 284 Nyoro
 193 - 251 - 247 - 292 - 217 322 vs TR-132 (A-3,4,5)
 cents

-ditto-
 168 200 224 252 304 336 vs
 202 - 196 - 204 - 325 - 173 cents

nango x 8
 144 168 194 248 286 336 vs Ganda TR-139 (B-1,2)
 249 - 426 - 246 - 279 cents

Scales of some instruments (cont'd)

-10.73-	<u>ntongoni</u> x 6								<u>Soga/Gwere</u>	TR-140	(B-9)
	98	110	140	158	196	220	vs				
			417	209	374	200	cents				
	<u>tongoli</u> x 8								<u>Dhola</u>	TR-130	(A-8)
	164	186	210	244	280	328	372	420	vs		
				260	238	274	218	210	cents		
	<u>adedeu</u> x 5								<u>Teso</u>	TR-130	(B-3,4)
	142	172	190	212	284	vs					
			332	172	190	504	cents				
	<u>bonguma</u> x 5								<u>Balendu</u>	TR-119	(B-3,4)
	224	252	292	324	296	vs					
			204	255	180	347	cents				

A E R O P H O N E S-11.0- HORNS

-11.11- Wooden horns, end blown.

	<u>mbala</u> x 7								<u>Yogo</u>	TR-118	(B-5)
	192	204	236	268	288	336	384	vs			
			105	252	221	124	267	231	cents		

-11.323- Vertical Flutes, ensembles of single pipes.

	<u>malenge</u> x 10								<u>Konjo</u>	TR-131	(B-6)	
	336	380	424	448	480	544	576	664	736	776	vs	
			313	190	95	119	227	99	246	178	92	cents
	<u>vianza</u> x 13								<u>Zaramo</u>	TR-158	(B-1,2)	
	292	336	392	440	520	584	vs					
			243	267	200	289	201	cents				
	<u>ditlhaka</u> x 19								<u>Tswana/Lete</u>	TR-111	(B-2)	
	432	584	664	760	864	vs						
			522	222	234	222	cents					
	<u>chikona</u> x 11								<u>Venda</u>	TR-193	(A-1)	
	216	228	248	280	316	348	380	432	vs			
			94	146	209	209	168	152	222	cents		
	<u>chimveka</u> x 9								<u>Chopi</u>	TR-204	(B-9,10)	
	348	372	412	448	488	544	592	632	vs			
			115	177	145	148	188	147	112	cents		
	<u>shanga</u> x 10								<u>Sena/Tonga</u>	TR-85	(A-3,4)	
	384	416	448	504	552	600	680	744	784	vs		
			139	128	204	157	145	217	155	91	cents	

-11.42- Panpipes, in ensembles.

	<u>mishiba</u> x 16 sets								<u>Luba/Songe</u>	TR-25	(A-2)
	268	316	352	380	408	448	vs				
			284	188	132	123	162	cents			

Scales of some instruments (cont'd)

I D I O P H O N E S-12.2- XYLOPHONES

-12.21- Xylophone, loose notes on supports, without resonators.

madinda x 12
172 194 228 260 304 344 vs Ganda TR-137 (A-5,6)
208 - 280 - 227 - 271 - 217 cents

-ditto- x 17
312 364 416 464 560 624 vs TR-137 (B-3,4)
267 - 231 - 189 - 325 - 178 cents

-ditto- x 12
232 264 308 360 396 464 vs TR-138 (A-1,2,3,4)
223 - 267 - 270 - 165 - 275 cents

kponingbo or akpaningbo x 9
196 248 284 332 360 392 vs Zande/Bandiya TR-123 (A-1)
408 - 234 - 270 - 140 - 148 cents

-ditto- x 11
244 292 336 392 440 488 vs TR-123 (A-5,6)
311 - 243 - 267 - 200 - 179 cents

ndara x 13
240 256 280 340 404 480 vs Dhola TR-130 (A-4,5)
112 - 155 - 137 - 298 - 298 cents

-12.23- Xylophone, notes fastened on supports, without resonators.

magogodo x 10
240 288 312 384 424 480 vs Nyanja/Mang'anja TR-89 (B-6,7,8)
316 - 139 - 359 - 172 - 214 cents

kpingbi x 6
Benge TR-128 (B-1,2)
392 448 496 528 592 672 vs
231 - 177 - 107 - 199 - 219 cents

-12.262- Xylophone on frame, with resonators, open mirliton.

silimba x 14
194 220 240 260 288 320 388 vs Luba TR-39 (A-1,2,3)
218 - 150 - 139 - 177 - 182 - 334 cents

-ditto- x 15
196 224 240 260 292 328 392 vs Kanyoka TR-15 (A-1,2,5)
231 - 119 - 139 - 201 - 201 - 309 cents

siyamboka x 9
206 228 256 272 312 356 412 vs Lozi TR-67 (B-8,9)
176 - 200 - 105 - 238 - 228 - 253 cents

silimba x 12
216 240 268 288 320 368 400 432 vs Valley Tonga TR-45 (B-1)
182 - 192 - 124 - 182 - 242 - 145 - 133 cents

Scales of some instruments (cont'd)

- 12.262- ulimba x 21 Nyanja/Mang'anja TR-89 (A-1,2)
 126 144 158 174 190 210 232 252 vs
 231 - 160 - 178 - 152 - 173 - 173 - 143 cents
- 12.263- Xylophone, on frame, notes with mirliton and trumpet.
- timbila Chopi TR-198 (A-1,2)
 248 276 308 336 372 412 456 496 vs
 184 - 190 - 151 - 176 - 177 - 176 - 146 cents
- ditto- TR-200 (B-3)
 248 272 300 336 372 412 448 496 vs
 159 - 170 - 196 - 176 - 177 - 145 - 177 cents
- ditto- TR-202 (B-4)
 248 276 300 324 360 404 440 496 vs
 184 - 145 - 133 - 182 - 200 - 148 - 108 cents
- ditto- TR-206 (A-1,2,3,4,5,6,7)
 248 300 332 368 404 448 488 496 vs
 329 - 175 - 178 - 162 - 179 - 76 - 101 cents
- ditto- TR-207 (A-1,2,3)
 268 300 328 364 400 440 488 536 vs
 195 - 154 - 181 - 163 - 165 - 179 - 163 cents
- ditto- TR-207 (A-4,5,6)
 268 304 336 360 400 440 488 536 vs
 218 - 173 - 119 - 183 - 165 - 179 - 163 cents
- ditto- TR-207 (B-4,5)
 248 272 296 328 364 404 448 496 vs
 159 - 147 - 177 - 181 - 180 - 179 - 177 cents
- ditto- TR-208 (B-2,3,4,5)
 248 272 300 328 364 404 448 496 vs
 159 - 170 - 154 - 181 - 180 - 179 - 177 cents
- 12.264- Xylophone, on frame, resonated, tube mirliton.
- madimba x 10 Luba/Lulua TR-35 (A-3,4)
 132 160 178 224 236 264 vs
 333 - 185 - 398 - 90 - 194 cents
- 13.0- MBIRA Plucked reed instrument.
- 13.112- Mbira, one manual, board, external resonator.
- chisanzhi x 8 Luchazi TR-184 (B-4,5)
 256 276 320 348 388 424 512 vs
 130 - 256 - 146 - 188 - 154 - 326 cents
- 13.114- Mbira, one manual, fan-shaped, external resonator.
- kankowela x 10 Valley Tonga TR-41 (B-6)
 240 264 296 320 356 400 432 480 vs
 165 - 199 - 134 - 185 - 202 - 133 - 182 cents

Scales of some instruments (cont'd)

- 13.114- ditto-
 264 292 328 356 396 432 472 Valley Tonga
 175 - 201 - 142 - 184 - 151 - 153 - 194 cents vs TR-41 (B-7)
- ditto-
 264 296 320 356 400 432 480 528 vs TR-42 (B-2)
 165 - 199 - 134 - 185 - 202 - 133 - 182 cents
- chizanzhi x 8
 212 232 266 280 304 344 Lunda
 156 - 236 - 89 - 143 - 214 - 172 - 190 cents vs TR-179 (B-5,6)
- 13.115- Mbira, one manual, bell shaped resonator.
mumamba x 10
 140 154 170 190 210 232 252 Bemba
 165 - 172 - 192 - 173 - 173 - 143 - 182 cents vs TR-24 (A-1)
- chilimba x 11
 228 252 280 308 340 376 Bemba
 173 - 182 - 165 - 172 - 174 - 208 - 126 cents vs TR-182 (B-7)
- sansi x 8
 202 232 264 308 344 404 vs Nyanja/Chewa
 240 - 223 - 267 - 192 - 278 cents TR-78 (A-1)
- 13.116- Mbira, one manual, bell shaped with external resonator.
sansi x 10
 176 224 260 292 332 252 vs Nyanja/Chewa
 150 - 267 - 258 - 201 - 324 cents TR-191 (A-10,11,12)
- 13.117- Mbira, one manual, box resonator.
marimbe x 18
 166 184 204 228 252 280 308 Zinza
 178 - 179 - 193 - 173 - 182 - 165 - 130 cents vs TR-147 (A-3,4,5,6)
- malimba x 13
 244 284 320 336 372 416 448 Nyamwezi
 263 - 206 - 85 - 176 - 194 - 128 - 148 cents vs TR-148 (A-1,2)
- ilimba x 20
 268 300 332 404 464 536 vs Gogo
 195 - 175 - 340 - 240 - 250 cents TR-154 (B-4,5)
- kalimba x 7
 182 198 240 276 328 364 vs Tumbuka/Henga
 145 - 333 - 252 - 299 - 181 cents TR-90 (B-3)
- 13.118- Mbira, one manual, box with external resonator.
limba x 7
 224 272 320 368 404 448 vs Nyakyusa
 336 - 281 - 242 - 162 - 176 cents TR-158 (A-5)
- ditto- x 8
 178 212 252 284 312 328 356 vs
 303 - 299 - 207 - 163 - 86 - 142 cents

Scales of some instruments (cont'd)

- 13.124- Mbira, one manual, fan shaped with external resonator.
- | | | | | | | | | | | |
|---------------------|-------|-------|------|-------|-------|-----|--|--|---------------------|------------------|
| <u>kalimba</u> x 10 | | | | | | | | | <u>Nyanja/Chewa</u> | TR-191 (B-2,3,4) |
| 296 | 360 | 396 | 456 | 476 | 536 | 592 | | | vs | |
| 338 | - 165 | - 245 | - 74 | - 206 | - 172 | | | | cents | |
- 13.127- Mbira (likembe), one manual, box resonated.
- | | | | | | | | | | | |
|---------------------|-------|-------|-------|-------|-----|--|--|--|-------------|--------------|
| <u>budongo</u> x 11 | | | | | | | | | <u>Soga</u> | TR-140 (A-6) |
| 328 | 368 | 432 | 496 | 560 | 656 | | | | vs | |
| 199 | - 278 | - 240 | - 209 | - 274 | | | | | cents | |
- ditto-
- | | | | | | | | | | | |
|-----|-------|-------|-------|-------|-----|--|--|--|-------|----------------|
| 260 | 304 | 352 | 400 | 464 | 520 | | | | vs | TR-141 (A-1,2) |
| 271 | - 254 | - 221 | - 257 | - 197 | | | | | cents | |
- ikembe x 10
- | | | | | | | | | | | |
|-----|-------|-------|-------|-------|-----|--|--|--|----------------------|----------------|
| 300 | 368 | 396 | 464 | 528 | 600 | | | | <u>Rundi/Hangaza</u> | TR-147 (B-1,2) |
| 353 | - 127 | - 275 | - 223 | - 222 | | | | | cents | |
- chisanzhi x 15
- | | | | | | | | | | | |
|-----|-------|-------|------|-------|-------|-----|--|--|-------------|-----------------|
| 134 | 150 | 178 | 212 | 224 | 240 | 268 | | | <u>Luba</u> | TR-40 (A-4,5,6) |
| 195 | - 296 | - 303 | - 95 | - 119 | - 192 | | | | cents | |
- chisanzhi (likembe) x 10
- | | | | | | | | | | | |
|-----|-------|-------|-------|-------|-----|--|--|--|-------------|----------------|
| 324 | 392 | 424 | 496 | 548 | 648 | | | | <u>Luba</u> | TR-177 (B-3,4) |
| 330 | - 136 | - 272 | - 172 | - 290 | | | | | cents | |
- ditto- x 10
- | | | | | | | | | | | |
|-----|------|-------|-------|-------|-------|-----|--|--|-------|----------------|
| 328 | 380 | 392 | 432 | 488 | 592 | 656 | | | vs | TR-177 (B-5,6) |
| 155 | - 54 | - 168 | - 211 | - 335 | - 177 | | | | cents | |
- ditto- x 12
- | | | | | | | | | | | |
|-----|-------|-------|-------|-------|-------|-----|--|--|-------|--------------|
| 244 | 268 | 284 | 320 | 364 | 440 | 488 | | | vs | TR-178 (B-1) |
| 163 | - 100 | - 206 | - 224 | - 328 | - 179 | | | | cents | |
- ditto- x 12 (bilonda mode)
- | | | | | | | | | | | |
|-----|-------|-------|-------|------|-------|-----|--|--|-------|--------------|
| 268 | 300 | 352 | 396 | 448 | 472 | 536 | | | vs | TR-178 (B-2) |
| 195 | - 277 | - 203 | - 214 | - 90 | - 221 | | | | cents | |
- ditto- x 10
- | | | | | | | | | | | |
|-----|-------|-------|-------|-------|-----|--|--|--|-------|--------------------|
| 184 | 220 | 244 | 292 | 352 | 368 | | | | vs | TR-178 (B-5,6,7,8) |
| 76 | - 324 | - 311 | - 179 | - 310 | | | | | cents | |
- ditto- x 10
- | | | | | | | | | | | |
|-----|-------|-------|------|-------|-----|--|--|--|-------------------|-------------|
| 132 | 160 | 178 | 224 | 236 | 264 | | | | <u>Luba/Lulua</u> | TR-35 (B-1) |
| 333 | - 185 | - 398 | - 90 | - 194 | | | | | cents | |
- mang'baru (likembe) x 10
- | | | | | | | | | | | |
|-----|-------|-------|-------|-------|-----|--|--|--|--------------|--------------|
| 364 | 424 | 488 | 536 | 584 | 728 | | | | <u>Nande</u> | TR-127 (B-9) |
| 264 | - 243 | - 163 | - 148 | - 382 | | | | | cents | |
- katima x 9
- | | | | | | | | | | | |
|-----|-------|-------|-------|-------|-----|--|--|--|-------|---------------|
| 364 | 424 | 488 | 536 | 600 | 728 | | | | vs | TR-127 (B-10) |
| 264 | - 243 | - 163 | - 195 | - 335 | | | | | cents | |
- kiliyo x 9
- | | | | | | | | | | | |
|-----|-------|------|-------|-------|-----|--|--|--|-------|---------------------|
| 364 | 408 | 512 | 536 | 632 | 728 | | | | vs | TR-127 (B-11,12,13) |
| 197 | - 393 | - 80 | - 284 | - 246 | | | | | cents | |

Scales of some instruments (cont'd)

- 13.127- ekembe x 10
212 236 284 324 348 372 (424) vs Binza
185 - 321 - 228 - 124 - 115 - 227 cents TR-128 (A-5,6,7,8)
- kombi x 12
224 260 300 344 384 448 vs Yogo
258 - 248 - 237 - 190 - 267 cents TR-118 (B-6,7)
- mbele ko fuku x 10
280 328 380 424 472 560 vs Mvu
274 - 255 - 190 - 185 - 296 cents TR-119 (A-11,12)
- neikembe x 11
320 360 396 432 480 528 592 Medje 640 vs
204 - 165 - 151 - 182 - 165 - 199 - 134 cents TR-120 (B-1,2)
- isanzo (likembe) x 10
268 292 328 392 448 536 vs Zande
148 - 201 - 309 - 231 - 311 cents TR-121 (B-7,8,9,10)
- ekembe x 12
220 244 292 324 360 440 vs Zande/Bandiya
179 - 311 - 180 - 182 - 348 cents TR-122 (B-4,5,6)
- natine and minu x 10
268 312 364 424 472 536 vs Alur
263 - 267 - 264 - 185 - 221 cents TR-124 (A-5,6)
- 13.157- Mbira (likembe) one manual, box resonated.
- muchapata x 10
244 268 312 336 376 416 488 vs Luvale/Lwena
163 - 263 - 128 - 195 - 175 - 276 cents TR-36 (B-1,2)
- 13.212- Mbira, board, with external resonator.
- deza x 26
192 208 232 256 288 316 352 Valley Tonga 384 vs
139 - 189 - 170 - 204 - 160 - 188 - 150 cents TR-41 (A-3)
- 13.214- Mbira, two manuals, fan shaped with external resonator.
- kankowele x 11
252 280 316 328 372 412 440 Lala 504 vs
182 - 209 - 65 - 218 - 177 - 114 - 235 cents TR-14 (A-6,7,8,9)
- kalimba x 10
220 (248) 276 328 368 408 440 vs Sena/Nyungwe
208 - 184 - 299 - 199 - 179 - 131 cents TR-91 (A-4,5)
- kangombio x 14
138 154 174 188 210 224 256 Lozi 276 vs
190 - 212 - 106 - 219 - 112 - 231 - 130 cents TR-67 (B-4,5)
- ditto-
276 308 348 376 420 448 512 552 vs
190 - 212 - 134 - 191 - 112 - 231 - 130 cents TR-67 (B-6)
- mbira x 13
212 260 288 316 340 380 424 vs Karanga/Duma
353 - 177 - 160 - 128 - 192 - 190 cents TR-80 (A-2,3)

Scales of some instruments (cont'd)

-13.215- Mbira, two manual, bell resonator.

<u>mbira</u> x 16							<u>Venda</u>		TR-193	(A-2)
280	308	348	384	416	468	520	560	vs		
165 - 212 - 170 - 139 - 204 - 182 - 128 cents										

-13.216- Mbira, two manual, bell with external resonator.

<u>mbira</u> x 14							<u>Sena/Nyungwe</u>		TR-91	(A-3)
240	260	288	316	352	392	424	480	vs		
139 - 177 - 160 - 188 - 186 - 136 - 214 cents										

-13.231- Mbira, two manual, board resonated.

<u>mbira</u> x 24							<u>Venda</u>		TR-193	(A-3,4)
248	272	308	336	372	412	448	496	vs		
159 - 215 - 151 - 176 - 177 - 145 - 177 cents										

-13.244- Mbira, two manual, fan shaped, external resonator.

<u>kangombio</u> x 15							<u>Lozi</u>		TR-51	(B-4)
198	220	236	260	296	320	356	396	vs		
183 - 121 - 168 - 225 - 134 - 185 - 184 cents										

<u>kathandi</u> x 14							<u>Mbunda</u>		TR-184	(A-1,2)
194	210	228	244	272	308	344	388	vs		
137 - 143 - 117 - 188 - 215 - 192 - 208 cents										

-13.341- Mbira, three manual, board resonated.

<u>mbira dza waNdau</u> x 28							<u>Ndau</u>		TR-176	(B-1,2)
220	260	296	332	364	392	440	vs			
289 - 225 - 198 - 160 - 128 - 200 cents										

-13.345- Mbira, three manual, bell resonator.

<u>mbira dza waNdau</u> x 32							<u>Ndau</u>		TR-205	(B-3)
204	224	256	300	348	388	408	vs			
162 - 231 - 275 - 257 - 188 - 87 cents										

-13.346- Mbira, three manual, bell with external resonator.

<u>mbira dza waNdau</u> x 30							<u>Ndau</u>		TR-176	(B-5,6,7)
184	202	216	252	288	328	368	vs			
162 - 116 - 267 - 231 - 225 - 199 cents										

-13.372- Mbira, three manual, board with external resonator.

<u>chisanzhi</u> x 19							<u>Kanyoka</u>		TR-15	(B-3)
332	376	456	520	568	616	664	vs			
216 - 334 - 227 - 153 - 140 - 130 cents										

-13.411- Mbira, one manual, board resonator, bamboo reeds.

<u>kisazhi</u> x 6							<u>Chokwe</u>		TR-180	(A-5,6,7)
37	54	59	74	118	vs					
654 - 153 - 393 - 807 cents										

Scales of some instruments (cont'd)

-13.479- Mbira, one manual, bowl resonator.

ngombi x 8134 148 178 200 228 268 vs Ngbandi
172 - 319 - 202 - 227 - 280 cents

TR-121 (B-1,2)

-ditto-

166 182 200 212 236 (276) (304) 332 vs
160 - 163 - 101 - 185 - 271 - 168 - 152 cents

TR-121 (B-3,4)

MEMBRANOPHONES-14.0- DRUMS

-14.211- Tuned drums, conical, pegged, tuned with paste.

likhuba x 976 128 152 186 220 256 292 Nyanja/Mang'anja
298 - 349 - 291 - 262 360 396 vs
cents

TR-88 (A-7,8)

-ditto- x 9

97 118 132 162 194 228 264 324 388 vs
280 - 253 - 355 - 312 cents

TR-89 (B-3)

-ditto- x 8

132 140 156 168 190 228 264 vs
102 - 188 - 128 - 213 - 316 - 253 cents

TR-93 (A-1,2)

