# ABERRANT WOODLAND KINGFISHERS - A FOLLOW-UP

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Hanmer (1983) described four Woodland Kingfishers *Halcyon senegalensis* caught at Nchalo, Malawi (16°16S; 34°55E), each with a bilateral patch of red on the normally black mandible (Fig. 1a). Fry (1983) suggested that these birds might be hybrids between the Woodland and Mangrove Kingfisher *H. senegaloides*.

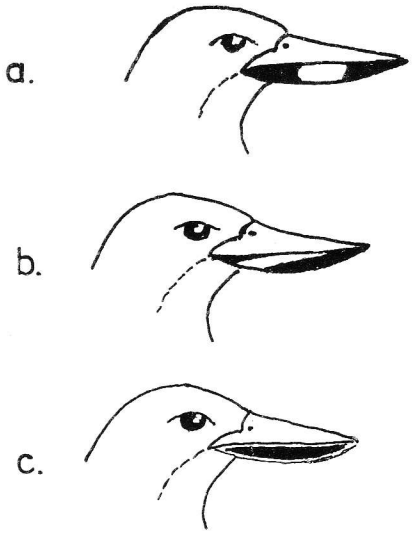


FIGURE 1

ABERRANT WOODLAND KINGFISHER BILLS

(a) RED PATCH IN CENTRE OF PROFILE; FOUR BIRDS FROM NCHALO AND ONE FROM TRING.

(b) RED WEDGE; ONE BIRD FROM NCHALO AND TWO FROM TRING.

(c) PALE LINE ON GONYS AND/OR CUTTING EDGE OF MANDIBLE (POST-MORTEM EFFECT); EIGHT BIRDS FROM TERVUREN MUSEUM.

The two species are very similar, differing in wing length, bill length, width and depth (See Appendix Tables 1-4 on pages 66-70) and leg and mandible colour. The Mangrove Kingfisher has a greyish, not greenish-blue crown (G.R. Cunningham-van Someren *in litt.*, Newman 1984), a whiter chest (Dr. A. Prigogine *in litt.*), a black patch on the carpal joint of the under-wing (white in the Woodland Kingfisher) (Greig-Smith 1978, Fry 1980, 1984) and less extensive blue on the back, occurring only on the rump and lower back (I. Sinclair *in litt.*). The Mangrove Kingfisher also has a different call which, although clearly derived from that of the Woodland Kingfisher, consists of loud notes in slowing cadence instead of a raucous trill (Snow 1978). Unfortunately most of the aberrant Nchalo birds were not examined to see if they differed in the above characters from normal Woodland Kingfishers. One 15-month-old bird caught in March 1984, with a differently marked bill (Fig. 1b), differed in no other character from a normal Woodland Kingfisher.

M.P.S. Irwin (*in litt.*) suggested that the Mangrove Kingfisher could be regarded as a coastal race of the Woodland, which instead of a post-breeding migration to low latitudes, merely moves a short distance to coastal mangroves for the winter. Dr. C.H. Fry (*in litt.*) commented that doubtless the Mangrove Kingfisher is an evolutionarily very young derivative of the Woodland. Irwin (*in litt.*) said that the two populations may in part be separated only ecologically, so that isolating mechanisms could break down and hybridization occur in zones where their breeding ranges overlap. Cunningham-van Someren (*in litt.*) thought that it was doubtful if there could be hybridization, but Prigogine (*in litt.*) considered that the Mangrove Kingfisher represents a taxon close to the Woodland, so that occasional hybridization seems possible, provided it can be demonstrated that the two species are in contact.

Fry (*in litt.*) wondered whether the two kingfisher species differ behaviourally, Greig-Smith (1978) described the breeding behaviour of the Woodland Kingfisher, but little appears to be known about the Mangrove Kingfisher. Both may breed in tree holes or arboreal termitaria (Mackworth-Praed & Grant 1961, Pike 1966, Clancey 1971, Snow 1978, Kirschner 1984, Irwin *in litt.*), so that nest site need not be a separating influence. The difference in voice should tend to keep them apart, except under very special conditions and the different colour pattern shown in the wing-spread display might play an important part in species recognition. However, Greig-Smith (1978) says that the Woodland Kingfisher appears to use the wing-spread display mainly in a territorial context, as do several other *Halcyon* kingfishers. Presumably the Mangrove Kingfisher does so too, in which case wrong carpal colour might not affect pairing.

Before pursuing the hypothesis of hybridization, it seemed advisable to discover whether or not the Woodland Kingfisher is genetically unstable with regard to bill colour, i.e. whether

aberrant forms have been found elsewhere. Irwin (*in litt.*) examined the 80 specimens from Zimbabwe and Zambia which are in the National Museum of Zimbabwe, Bulawayo, and found none with aberrant bill colour. Dr.M. Louette (*in litt.*) examined the several hundred specimens from Zaire which are in the Tervuren Museum, Belgium, and found none resembling the Nchalo birds. He did find a few, eight in particular, which had a pale line along the cutting edge or running the length of the gonys (Fig. 1c), but many of these specimens are 50-70 years old and he considers that in all probability the black pigment merely becomes paler along the edges with age. Prigogine (*in litt.*) looked at the specimens from Zaire which are in the Brussels Museum, Belgium, and found only one aberrant bird with (now) a yellowish mandible. This may represent a genetic mutation or the bird might be a hybrid, but equally the colour may be due to the age of the specimen.

Sinclair (*in litt.*) looked at the Woodland and Mangrove Kingfisher specimens in the Durban Museum, but found no aberrant birds. Cunningham-van Someren (*in litt.*) looked at the specimens of both species which are in the National Museum of Kenya, Nairobi. He found one Woodland Kingfisher from northwestern Kenya which had a 16 mm patch of red on the base of the mandible and one, not fully adult female from near Mombasa, which had an orange bill with black tip to the mandible. Its plumage was more Mangrove Kingfisher than Woodland, as was bill size and wing length (Appendix Tables 1-4). It may be a hybrid, as there is some overlap of the two species at the coast, but he feels that on measurement it is probably a Mangrove Kingfisher.

Fry (1984) looked at the 266 specimens of Woodland Kingfisher which are in the British Museum of Natural History at Tring. He found 24 (9%) from all over Africa which had a yellow-brown maxilla and yellow-brown markings on up to 40% of the mandible. Most of these specimens are 75-110 years old, but two are only 15 years old. The markings on the mandible were mainly ventro-proximal with a few on the gonys, but one bird resembled the Nchalo (Fig. 1a) birds and two had bilateral diagonal wedges (Fig. 1b). He found more males than females with aberrations and found that most of the aberrant birds were immature (these mainly being marked ventro-proximally). However, the collector had not remarked on bill colour for any of these specimens, so it is entirely possible that the colour is a post-mortem artefact. He concludes that, if it is not a post-mortem artefact, it is sex and age related, appearing as large areas in young males, receding and in most cases vanishing, with maturity.

The above theory might fit with Milstein's (1983) comment that the newly-hatched Woodland Kingfisher has an orangy bill which darkens after about seven days, until the entire bill is

blackish. The timing, however, is variable and the darkening may not occur until the bird has left the nest (apropos of this, a very young red-billed juvenile was caught in the Transvaal); the scarlet maxilla is acquired later.

There is another possible explanation of the age-related aberrant markings, if they are post-mortem artefacts. The melanin in the bill of a young bird may not be as stable as it is in that of an adult and would, in that case, fade more rapidly, over a larger area. Also there are ten unsexed birds among the 24 Tring aberrants, so that the apparent preponderance of males may not be a true reflection of the sex ratio.

There have been two recent reports of aberrant Woodland Kingfishers; Newman (1984) mentions an all red-billed bird seen in the Kruger National Park (this bird had a black tip to both maxilla and mandible) and C. Sharp (*in litt.*) was told of an all red-billed bird in Gona Rezhou, Zimbabwe. At Nchalo a 15-month-old bird which had a bilateral red wedge on the mandible (Fig. 1b) was caught and (see Hanmer 1983) a few more otherwise normal adults have been caught at Nchalo which had the very tip of the maxilla blackish. This may not be a true aberration; the birds, although adult in plumage, may have retained the last vestiges of the immature black maxilla a little longer than usual, although it is far more commonly retained at the base of the bill.

Milstein's (1983) theory of delayed or partial melanin production and Fry's (1984) theory which is somewhat similar, may explain how some bills acquired aberrant colouration, but in the bird which was examined twice at Nchalo, the colour development was identical to that found in the black-billed young of other kingfisher species at Nchalo (Pygmy *Ispidina picta*, Malachite *Alcedo cristata*, Greyhooded *H. leucocephala* and Brownhooded *H. albiventris*). The black mandible of the immature (± 3 months old) was reddish in the centre of the profile. At ± 11 months old, that area had become a clear, bright scarlet. There was no indication of a reduction of the red with increasing age. The adults and one other immature also had a clear red patch in the centre of the profile, although the latest bird had a clear red wedge. This is a point in favour of hybridization or of genetic mutation, because in the Nchalo aberrant Woodland Kingfishers (those resembling Fig. 1a), a gene or genes for initiating the change from black to red on the mandible of young birds (which the true Woodland Kingfisher obviously does not normally possess) must have been present, even though the process stopped before the mandible was completely red. In the Kruger Park, Gona Rezhou and possibly Brussels Museum birds, presumably the process continued until the mandible was completely red. The developmental origin of the red wedge (Fig. 1b) is not immediately obvious, but presumably there is some genetic basis for the pattern.

For hybridization to be a possibility, it must be shown that the two species are in contact. The Woodland Kingfisher is a species of bushveld and dry wooded savanna (Clancey 1971) and is found on the edges of riparian forest, especially where tall *Acacia* grows on alluvium, breeding between November and January in Zimbabwe (Irwin 1981). In Malawi it breeds in drier woodland and savanna, especially *Acacia*, in December and January and does breed at Nchalo (Benson & Benson 1977). However, most of the birds seen or caught at Nchalo may have been on passage to or from breeding areas further south, as few were present between late November and early March and no aberrants were caught in December/January. At Mopeia, Mozambique, (Fig. 2) a few Woodland Kingfishers were present from October to April, in *Acacia* savanna on the Zambezi floodplain and in riparian woodland along the Cuacua River and probably bred there, although no evidence of this was obtained (Hanmer 1976). Elsewhere in Mozambique the status of the Woodland Kingfisher is unclear (Clancey 1971), but Snow (1978) shows the species present fairly generally, inland of the coastal plain, with one dot at Gorongoza and another at Sena (Fig. 2). Presumably the species breeds in Mozambique where there is suitable habitat.

The Mangrove Kingfisher breeds inland in forested areas (Clancey 1971) and Irwin (*in litt.*) found it very common in forest at Inhamitanga (Fig. 2) in December, where it appeared to be breeding, as collected specimens had enlarged gonads. The forest consisted of mixed, tall, emergent trees, baobabs and dense underlying thicket. The Inhamitanga forest covers a large area and Irwin considers that the Mangrove Kingfisher may breed widely in that vegetation. Snow (1978) shows the species present near Sena and an adult was seen at Mopeia in riparian woodland in early January (Hanmer 1976).

Fig. 2 shows the vegetation zones as given in Flora Zambesiaca (1960) for the relevant area of Mozambique. Mopeia lies in "Dry deciduous woodland with *Adansonia*, *Cordyla* or *Bombax*" (Type 2) and abutting on that to the east, "Palm savanna" (Type 3), but there are large patches of *Acacia* particularly to the east and south-east of Mopeia. Inhamitanga also lies in Type 2 vegetation and abutting on it to the west are areas of *Acacia* savanna (Types 9 & 10). South and east of Inhamitanga there is a mosaic of vegetation types (Types 5 & 8) along the edge of the Cheringoma Plateau.

Hanmer (1983) suggested that overlap between Mangrove and Woodland Kingfishers might occur in the Shire valley, at or near Malawi Hill (not shown in Fig. 2) and Morrumbala Mt. (Fig. 2), but Irwin (*in litt.*) disagreed, as he considered that too far inland for Mangrove Kingfisher to breed. The two species do overlap at Mopeia (both seen in close proximity during the breeding season) and at Sena (see Snow 1978). Irwin (*in litt.*) considers that in the mosaic of habitats east of the Cheringoma Plateau the two species may overlap and other likely areas would

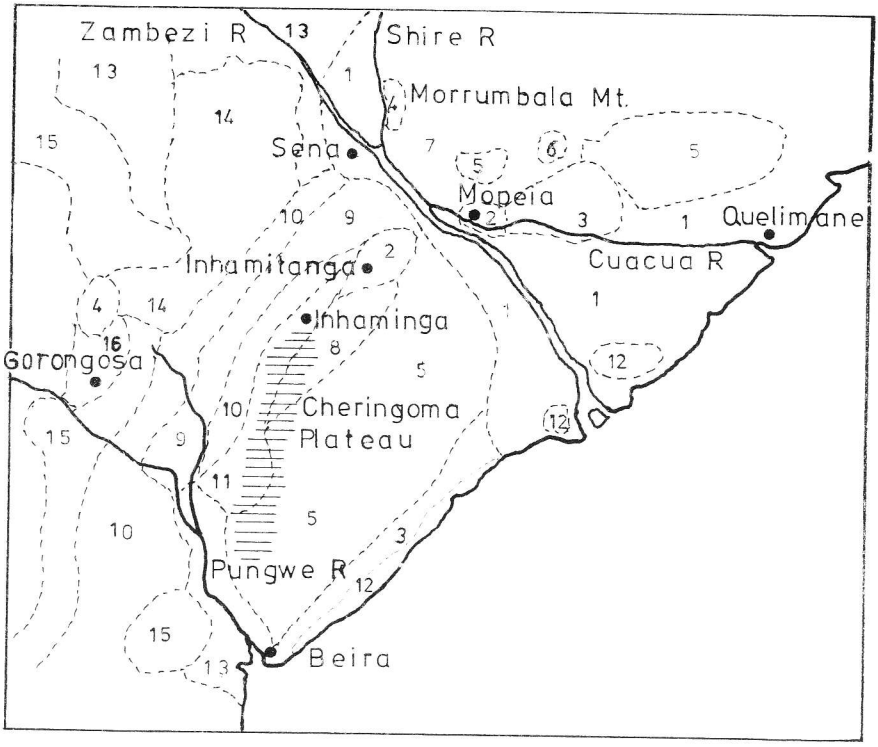


FIGURE 2

VEGETATION MAP (FLORA ZAMBESIACA 1960) OF THE INHAMITANGA AREA OF MOZAMBIQUE

1. Formation on alluvium.
2. Dry deciduous lowland with *Adansonia*, *Cordyla* or *Bombax*.
3. Palm savanna; *Hyphaene*, *Phoenix* and *Borassus*.
4. Moist evergreen forest (Rift Valley type).
5. Moist lowland forest/woodland mosaic with *Pteleopsis*, *Erythrophloem* and *Brachystegia*.
6. *Brachystegia* and *Julbernardia*.
7. *Brachystegia*.
8. Dry mixed woodland mosaic with *Adansonia*, *Cordyla*, *Brachystegia* and *Pteleopsis*.
9. *Acacia* spp. and *Hyphaenae* (Lower Gorongosa).
10. *Acacia nigrescens*.
11. *Combretum* and *Commiphora*.
12. Littoral dunes.
13. *Adansonia*, *Sterculia* and *Cordyla* tree savanna.
14. *Adansonia* and *Pterocarpus brenanii*.
15. *Julbernardia globiflora*.
16. *Parinari curatellifolia*.

be to the west of Inhamitanga/Inhaminga and up the Pungwe River towards Gorongosa. Woodland Kingfishers breeding in these areas would be likely to use the Shire Valley, past Nchalo, on their north-south migrations, so that, if hybridization did occur, one could expect aberrant birds to be caught at the permanent ringing station at Nchalo.

The fact that most of the (probably) genetically aberrant birds were collected or seen far from the range of the Mangrove Kingfisher, does not rule out hybridization, because the Woodland Kingfisher migrates towards the equator after breeding (Snow 1978) and could well have bred in proximity to Mangrove Kingfishers, as the two species may be in contact in many places along the eastern side of Africa (see Snow 1978). The red-billed bird seen in the Kruger Park may have come from the area of overlap near Maputo and the Gona Rezhou bird probably had come from somewhere in south-central Mozambique. Where the Brussels Museum bird and the Tring one, which was marked as Fig. 1a, had come from is unknown, but is is conceivable that the Tring one at least could have been bred on the eastern side of Africa.

In conclusion, there seem to be several possible explanations for aberrant bill markings. In museum specimens the black along the edges fades with age or the black fades in patches, particularly ventro-proximally in immatures where perhaps the black pigment was not yet stable. In life the red patches may be due to delayed melanin deposition in immatures or could be caused by genetic mutation or could be due to hybridization. If hybridization occurs in areas of mosaic habitat where the two species can overlap, then the solution to the problem set by the Nchalo aberrant Woodland Kingfishers probably lies in the woodlands and forests on the edge of the coastal plain of Mozambique.

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(See over for Appendix)

## APPENDIX

### MEASUREMENTS OF WOODLAND AND MANGROVE KINGFISHERS

TABLE 1 gives the wing length of Woodland and Mangrove Kingfishers. The Nchalo aberrant Woodland Kingfishers have wings of similar length to others of that species. Mangrove Kingfishers have shorter wings than do Woodland Kingfishers, but there is an overlap in length sufficient to make this measurement unsuitable to separate the two species and a hybrid would not necessarily have a wing length much shorter than the Woodland Kingfisher mean. The aberrant from Kenya appears to be a Mangrove Kingfisher.

TABLE 2 gives the bill (culmen) length. Kenyan Woodland Kingfishers have a much shorter bill than do birds found further south. The Nchalo aberrants do not differ from Woodland Kingfishers found in the same area, but neither do they differ from Mangrove Kingfishers. The Kenyan aberrant appears to be a Mangrove Kingfisher, being longer billed than Kenyan Woodland Kingfishers.

TABLE 3 gives the bill width at the nostril. Woodland Kingfishers all have a similar bill width, although Kenyan ones may be slightly wider, but numbers from other areas are small. The only Nchalo aberrant measured (with a red wedge on the bill) was within Woodland Kingfisher limits. Mangrove Kingfishers from Natal and Mozambique, however, had bills which were not much wider than Woodland Kingfishers, although Kenyan Mangrove Kingfishers had much wider bills. The Kenyan aberrant appears to be a Mangrove Kingfisher.

TABLE 4 gives the bill depth at the nostril. Woodland Kingfishers from Kenya and from Zimbabwe/Zambia have a similar bill depth. Those from other areas probably are similar, but numbers are small. The only Nchalo aberrant measured was within Woodland Kingfisher limits. Mangrove Kingfishers have a slightly deeper bill, but the overlap between the two species is such as to make the measurement unsuitable for separating them, although the actual appearance of the Mangrove Kingfisher's bill is much heavier.

TABLE 1

WING LENGTH OF WOODLAND AND MANGROVE KINGFISHERS

| SPECIES | LOCALITY | AGE/SEX | NORMAL OR ABERRANT | n | WING LENGTH (mm) RANGE | WING LENGTH (mm) MEAN ± SD |
|---|---|---|---|---|---|---|
| WOODLAND KINGFISHER | Bulawayo Museum Zimbabwe/ Zambia | Ad M+F | N | 14 | 109-118 | 114,1 ± 3,0 |
| | | Imm | N | 4 | 106-113 | 108,5 ± 3,1 |
| | Live Birds Nchalo, Malawi | Ad | N | 23 | 108-116 | 111,0 ± 1,9 |
| | | Imm | N | 11 | 106-112 | 108,8 ± 2,2 |
| | | Ad | A | 4 | 109-114 | 111,0 ± 2,5 |
| | | Imm | A | 3 | 107-111 | 108,7 ± 2,1 |
| | Mackworth-Praed & Grant (1961) | Ad | N | ? | 103-119 | |
| MANGROVE KINGFISHER | Bulawayo Museum Mozambique | Ad M+F | N | 7 | 100-108 | 103,7 ± 3,0 |
| | Nairobi Museum Kenya | Imm F | A | 1 | 96 | |
| | Mackworth-Praed & Grant (1961) | Ad | N | ? | 97-111 | |

TABLE 2

BILL LENGTH OF WOODLAND AND MANGROVE KINGFISHERS

| SPECIES | LOCALITY | AGE/SEX | NORMAL OR ABERRANT | n | BILL LENGTH (mm) | |
|---|---|---|---|---|---|---|
| | | | | | RANGE | MEAN ± SD |
| WOODLAND KINGFISHER | Nairobi Museum | | | | | |
| | Kenya/Uganda | Ad M+F | N | 18 | 37,5-46 | 42,1 ± 2,8 |
| | Bulawayo Museum | | | | | |
| | Zimbabwe/Zambia | Ad M+F | N | 14 | 46-52 | 48,6 ± 1,6 |
| | | Imm | N | 4 | 44-47 | 46,0 ± 1,4 |
| | Live Birds | | | | | |
| | Ncnalo, Malawi | Ad | N | 23 | 43-49 | 47,0 ± 1,8 |
| | | Imm | N | 11 | 44-49 | 45,9 ± 1,7 |
| | | Ad | A | 4 | 42-52 | 48,0 ± 4,9 |
| | | Imm | A | 3 | 46-50 | 47,7 ± 2,1 |
| | Durban Museum | | | | | |
| | Swaziland | Ad | N | 1 | 54,4 | |
| | Zambia | Ad/Imm | N | 2 | 47,3-49,3 | 48,3 |
| | Namibia | Ad | N | 3 | 48,7-54,0 | 52,1 ± 3,0 |
| MANGROVE KINGFISHER | Nairobi Museum | | | | | |
| | Kenya | Ad M+F | N | 4 | 44-54 | 49,5 ± 4,4 |
| | | Imm F | A | 1 | 47 | |
| | Bulawayo Museum | | | | | |
| | Mozambique | Ad M+F | N | 7 | 46-50 | 47,6 ± 4,4 |
| | Durban Museum | | | | | |
| | Natal/Mozambique | Ad | N | 7 | 50,0-53,9 | 52,1 ± 1,4 |
| | Kenya | Ad | N | 2 | 47,5-50,7 | 49,1 |

TABLE 3

BILL WIDTH OF WOODLAND AND MANGROVE KINGFISHERS

| SPECIES | LOCALITY | AGE/SEX | NORMAL OR ABERRANT | n | BILL WIDTH (mm) | |
|---|---|---|---|---|---|---|
| | | | | | RANGE | MEAN ± SD |
| WOODLAND KINGFISHER | Nairobi Museum | | | | | |
| | Kenya/Uganda | Ad M+F | N | 18 | 12,5-15 | 13,6 ± 0,6 |
| | Live Birds | | | | | |
| | Nchalo, Malawi | Ad | N | 6 | 12,5-14,0 | 13,1 ± 0,5 |
| | | Imm | A | 1 | 13,0 | |
| | Durban Museum | | | | | |
| | Swaziland | Ad | N | 1 | 13,5 | |
| | Zambia | Ad/Imm | N | 2 | 12,9-13,3 | 13,1 |
| | Namibia | Ad | N | 3 | 12,5-13,9 | 13,4 ± 0,8 |
| MANGROVE KINGFISHER | Nairobi Museum | | | | | |
| | Kenya | Ad M+F | N | 4 | 17,0-21 | 18,4 ± 1,8 |
| | | Imm F | A | 1 | 16 | |
| | Durban Museum | | | | | |
| | Mozambique/Natal | Ad | N | 7 | 13,9-15,0 | 14,4 ± 0,4 |
| | Kenya | Ad | N | 2 | 13,1-15,0 | 14,1 |

TABLE 4

BILL DEPTH OF WOODLAND AND MANGROVE KINGFISHERS

| SPECIES | LOCALITY | AGE/SEX | NORMAL OR ABERRANT | n | BILL DEPTH (mm) | |
|---|---|---|---|---|---|---|
| | | | | | RANGE | MEAN ± SD |
| WOODLAND KINGFISHER | Nairobi Museum | | | | | |
| | Kenya/Uganda | Ad M+F | N | 18 | 10,5-13,5 | 11,8 ± 0,7 |
| | Bulawayo Museum | | | | | |
| | Zimbabwe/Zambia | Ad M+F | N | 26 | 10,5-13,0 | 11,6 ± 0,6 |
| | Live Birds | | | | | |
| | Nchalo, Malawi | Ad | N | 6 | 12,0-13,0 | 12,4 ± 0,5 |
| | | Imm | A | 1 | 12,0 | |
| | Durban Museum | | | | | |
| | Swaziland | Ad | N | 1 | 13,0 | |
| | Zambia | Ad/Imm | N | 2 | 11,8-13,0 | 12,4 |
| | Namibia | Ad | N | 3 | 11,8-12,9 | 12,5 ± 0,6 |
| MANGROVE KINGFISHER | Nairobi Museum | | | | | |
| | Kenya | Ad M+F | N | 4 | 13-14 | 13,3 ± 0,5 |
| | | Imm F | A | 1 | 13 | |
| | Bulawayo Museum | | | | | |
| | Mozambique | Ad M+F | N | 7 | 12,0-13,3 | 12,8 ± 0,5 |
| | Durban Museum | | | | | |
| | Mozambique/Natal | Ad | N | 7 | 12,6-13,9 | 13,4 ± 0,5 |
| | Kenya | Ad | N | 2 | 13,0-14,1 | 13,6 |