

History and biology of the reassigned Ruvu Weaver *Ploceus holoxanthus*

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Summary

Ploceus holoxanthus was formally described by Karel Johan Gustav Hartlaub in 1891, based on specimens collected by Friedrich Bohndorff, from Mtoni on the Kingani (now Ruvu) River, Tanzania. Reichenow (1904, p 91) and Zedlitz (1916) synonymized this taxon with African Golden Weaver *P. subaureus*, although Shelley (1905) and Hartert (1907) had recognized it as a new species. Sclater (1930) and other subsequent authors simply considered *P. holoxanthus* as a synonym of African Golden Weaver, and eventually it was not even listed as a synonym. In recent years, birds resembling *P. holoxanthus* have been increasingly photographed. Thus, this taxon was included in a recent phylogeny of the Ploceidae, which recognized *P. holoxanthus* as a valid species. This paper reviews the history of this taxon, lists all specimens, published references and photographs, and measurements. The nest and eggs are described for the first time.

Keywords: *Ploceus holoxanthus*, *Ploceus subaureus*, Ruvu River, Mtoni, Bagamoyo, Zedlitz, Tanzania

Introduction

Ploceus holoxanthus (hereafter *holoxanthus*) has been recognized as a distinct species in a recent phylogenetic analysis (Fjeldså *et al.* 2020). This taxon was first described by Karel Johan Gustav Hartlaub, a German physician and ornithologist, based on specimens collected by Friedrich Bohndorff, a German explorer and ornithologist, from Mtoni on the Kingani (now Ruvu) River (6°28'45" S, 38°49'56" E), Tanzania (Hartlaub 1891, p 1–2). Although Shelley (1905) and Hartert (1907) had recognized it as a new species, Reichenow (1904, p 91) and Zedlitz (1916) synonymized this taxon with the African Golden Weaver *P. subaureus*. So did Sclater (1930) and other subsequent authors, and eventually *holoxanthus* was not even listed as a synonym. The African Golden Weaver has two distinctive subspecies, the nominate in southern Africa, and *P. subaureus aureoflavus* (hereafter *aureoflavus*) in eastern Africa; only the latter subspecies is relevant in this paper.

In recent years, birds resembling *holoxanthus* have been increasingly photographed. These observations highlighted the need to include this taxon in molecular phylogenetic analyses of the Ploceidae (Fjeldså *et al.* 2020), otherwise this taxon would probably have been overlooked. This paper reviews what is known about *holoxanthus* in the literature, and provides new breeding information based on field observations and photographs. In particular, we investigate the historical background and details of the collected specimens and how this led to the ‘disappearance’ of this taxon from the ornithological literature.

Methods

We searched for references to the taxon *holoxanthus* in published literature, using a bibliography of the Ploceidae family, numbering over 24 000 references. We extracted photographs in the PHOWN (PHOTOS of Weaver Nests, <http://weavers.adu.org.za/phown.php>) database, part of the Virtual Museum (<http://vmus.adu.org.za>) citizen science project at the University of Cape Town. Photographs also appear on some other websites.

Results and Discussion

1. Historical background

In the 1880s Friedrich Bohndorff (1848–1921) participated in expeditions to the African interior, where he collected insects and birds, including 30 bird types. Five avian taxa are named after him, including a weaver (subspecies) – the Village Weaver *P. cucullatus bohndorffi* (Reichenow 1887). In 1889, Bohndorff joined as a dragoman (i.e., interpreter and guide) of the Schutztruppe under Hermann von Wissmann (1853–1905) in German East Africa (now Tanzania), because of the Arab revolt of 1888–1890. In 1890, Bohndorff was assigned as deck officer on the Mtoni ferry to cross the Kingani River near Bagamoyo, before returning to Berlin in 1893 (Schweitzer 1898). Bohndorff was at Mtoni in January 1890 (R.J. Dowsett, pers. comm.) when he collected the types of the Ruvu Weaver, which were sent to Hartlaub together with the specimens from Emin Pascha (Hartlaub 1891, p 1).

Emin and Bohndorff

Stanley brought Emin to Bagamoyo where they arrived on 4 December 1889. Emin had an accident on the first night, and remained in hospital until late January 1890. He conducted some collecting around Bagamoyo while planning his return to Uganda, and finally left on 26 April 1890 (Schweitzer 1898). Emin wrote a letter to Hartlaub on 27 January 1890 from his hospital bed in Bagamoyo, mentioning the specimens to later be sent with his letter, from the German consulate in Zanzibar (Stuhlmann & Schubotz 1921, p 288). Although Emin did not mention Bohndorff's specimens in the letter, these were presumably added while a hired taxidermist helped Emin prepare the specimens.

The consignment of specimens that was sent to Germany included birds of three collections (Hartlaub 1891):

1. Specimens collected by Emin on the latter part of Stanley's expedition.
2. Eight species collected by Bohndorff, all labelled 'Mtoni', including *holoxanthus*, collected in January or March (see below); a date of January was given for one specimen (*Sternula novella* = *Sterna albifrons*).
3. 29 species collected by Emin around Bagamoyo, between February and April 1890; in three cases dates in February are provided (Hartlaub 1891). For only one species, *Pyromelana nigriiventris* (= *Euplectes nigroventris*), did Emin collect one each at Mtoni and Bagamoyo, thus possibly meeting Bohndorff at Mtoni.

Emin's shipment to Hartlaub must have been finally boxed before Emin left Bagamoyo in late April 1890, and arrived at the British Museum in July 1890 (Anon. 1894). Hartlaub would have needed some time to work through the material and his paper describing the above specimens was published in April 1891.

Specimens

Hartlaub (1891) described the *holoxanthus* holotype (AMNH #724738, LeCroy 2014), without mentioning other specimens (Table 1). However, Bohndorff also collected a female (Hartert 1907, LeCroy 2014). Shelley (1905) mentioned two males and two females in the British Museum, all collected by Bohndorff at Mtoni. The specimens were at Tring until 1932 when Rothschild sold most of his skin collection to the American Museum of Natural History in New York (LeCroy 2014). LeCroy (2014) lists two specimens, suggesting that Shelley's (1905) additional specimens were lost, or are still in a museum somewhere, or were mis-identified (but this is less likely because of his detailed description). Many type specimens of names introduced by Hartlaub are in the Bremen Museum collection, but Sánchez Osés (2010, p 67) noted that no *holoxanthus* types were found there.

Table 1. List of specimens of the Ruvu Weaver *Ploceus holoxanthus* collected by Bohndorff at Mtoni, Tanzania.

Type/specimens	Sex	Source
1. AMNH 724738, holotype	male	LeCroy (2014), Hartlaub (1891)
2. AMNH	female	LeCroy (2014), Shelley (1905)
3. specimen (current location unknown)	male	Shelley (1905)
4. specimen (current location unknown)	female	Shelley (1905)

In his introduction, Hartlaub notes that Bohndorff's specimens were quite well prepared and provided with the necessary notes (Hartlaub 1891, p 1), and he also acknowledges the help and information provided by Anton Reichenow (Berlin), George Ernest Shelley, Henry Seebohm and Richard Bowdler Sharpe (Tring). Shelley and Sharpe briefly saw the *holoxanthus* specimen and were hesitant at the time of separating it from *aureoflavus*, while Reichenow agreed with Hartlaub (Hartlaub 1891, p 22).

Date of specimens

Shelley (1905) gives the collection date as March, while Hartert (1919), Turner & Baker (2011) and LeCroy (2014) give January, which is more likely from a historical point. However, it is possible that additional specimens (i.e., those that Shelley saw) were collected in March, and added to the consignment sent to Hartlaub.

2. Loss of a species, and re-instatement

Hartlaub (1891) described *holoxanthus* as a new species (Table 2), with which Reichenow (1894, 1897) initially concurred, but later he considered it as a synonym of *aureoflavus* (Reichenow 1904, p 91). Nevertheless, Shelley (1905), and initially Hartert (1907), considered *holoxanthus* as unique.

Table 2. List of all references mentioning Ruvu Weaver *Ploceus holoxanthus*, with annotations, listed chronologically. Taxon: sp = species (*holoxanthus* recognized at species level); syn = synonym (*holoxanthus* recognized as synonym); n/a = author lists *holoxanthus* without assigning taxonomic status.

Reference	Taxon	Notes (reference to <i>holoxanthus</i>)
Hartlaub (1891)	sp	Described new species; Reichenow saw the type and agreed with Hartlaub that it was new; Sharpe and Shelly saw it briefly and were hesitant to consider it separable [published April 1891]
Reichenow (1891b)	sp	Notification of recent publication - listed (in German, from meeting on 23 April 1891)
Anon. (1891)	sp	Notification of recent publication - listed (July 1891 issue of <i>Ibis</i>)
Reichenow (1894)	sp	Gave a brief summary of the species, distinguishing it from <i>P. aureoflavus</i>
Shelley (1896)	sp	List of African birds, including <i>Ploceus holoxanthus</i>
Reichenow (1897)	sp	List of East African birds, including <i>Ploceus holoxanthus</i>
Reichenow (1904), pp.91-92	syn	Now treated it as a synonym of <i>P. aureoflavus</i> [= <i>subaureus</i> - Reichenow appears to have had a single specimen that he looked at, and he considered that it was a mature phase of African Golden Weaver
Shelley (1905)	sp	Referred to Reichenow 1904 but nevertheless considered <i>holoxanthus</i> to be unique, apparently based on 4 specimens, 2 males and 2 females; first description of female; Shelley provided a plate of a male
Anon. (1905)	sp	Notification of recent publication—and the plates in Shelley (1905)
Hartert (1907)	sp	Also considered <i>holoxanthus</i> as distinct, based on plumage and measurements of 2 specimens, a male and a female
Sharpe (1909)	sp	List of species with range of each species (listed as <i>Sitagra holoxantha</i> from “Zanzibar”)
Zedlitz (1916)	syn	Argued that Reichenow [1904] was correct; Zedlitz looked at a series of “golden weaver” specimens, mostly from the Berlin Museum, however, he did not see the <i>holoxanthus</i> types
Hartert (1919)	syn	Now agreed with Zedlitz (1916), as Hartert thought Zedlitz had studied a large series of <i>holoxanthus</i> specimens
Sclater (1930)	syn	Synonymy of African birds; <i>holoxanthus</i> listed as synonym of <i>aureoflavus</i>
Moreau & Moreau (1937)	n/a	Discussed golden weavers in Tanzania, considered some specimens to be <i>holoxanthus</i> (but should probably be <i>P. castaneiceps</i>)
Moreau (1962)	syn	Synonym of <i>P. subaureus aureoflavus</i>
Sánchez Osés (2010)	syn	No specimens found in Bremen Museum
Turner & Baker (2011)	n/a	Status of <i>P. bojeri</i> ; refer to Moreau & Moreau’s (1937) reference to <i>holoxanthus</i>
LeCroy (2014)	syn	Holotype details in AMNH; mentions female with no details
Mills & Leventis (2017)	sp	List of African birds; accepted as a separate species
Turner & Kennedy (2019)	sp	Brief note on the loss of <i>holoxanthus</i> , and a call for a full systematic review
Fjeldså <i>et al.</i> (2020)	sp	Genetic analysis, showing <i>holoxanthus</i> is a distinct species

In a discussion of the birds of southern Somalia, Zedlitz (1916) included two 'golden weaver' species, Golden Palm Weaver *P. bojeri* and *aureoflavus*, but also mentioned Taveta Golden Weaver *P. castaneiceps* and *holoxanthus*. While he gave new features to distinguish females of *P. bojeri* and *P. castaneiceps*, he did not recognize *holoxanthus* as separate from *aureoflavus*. He studied a long series of specimens in the Berlin Museum, and concluded that they were all *aureoflavus* [we agree], and therefore considered *holoxanthus* to be not valid [we disagree, see below].

In his discussion of types in the Tring Museum, Hartert (1919) synonymized *holoxanthus* with *aureoflavus*, simply based on Zedlitz (1916) and presumably without examining the *holoxanthus* specimens which were still at Tring. Sclater (1930) and other authors subsequently simply followed Zedlitz (1916) and Hartert (1919), and by 1932 the specimens had been sold to the AMNH.

Zedlitz's error

From the large series of *aureoflavus* specimens, Zedlitz singled out two that could be male *holoxanthus*, one from Mtiras village (collected by Fülleborn) and one from Msua (collected by Emin). He only noted these as potential '*holoxanthus*' because he thought the collecting sites were near Mtoni. The other specimens that Zedlitz mentioned, he and other authors never considered as *holoxanthus*, and their localities are also far from the known range of *holoxanthus*, and are not discussed further.

(1) Specimen from Mtiras (Mtira's or Kwa Mtira, Rovuma River at 11°33' S, 36°55' E). Zedlitz noted that the Mtiras specimen (collected in June; Reichenow 1904, p 92) was the second largest of his series (of *aureoflavus*) at 78 mm, i.e., being too large to be *holoxanthus*. Furthermore, Mtiras is on the Rovuma River on the Tanzanian-Mozambican border (Shelley 1905, p 478), some 475 km from Mtoni, contra Zedlitz. Shelley (1905, p 478) listed Fülleborn's Mtiras specimen under *aureoflavus* (*aureoflavus*), although he did mention the possibility that it could belong to *holoxanthus* (p 480). Unfortunately, the eye colour of this specimen is not documented, but due to the size of the bird we consider it to be *aureoflavus*.

(2) Specimen from Msua (near Bagamoyo at 6°46' S, 38°28' E; Msua in Reichenow 1891a). Emin left Bagamoyo in April 1890 with an expedition to return to Uganda. On 2-3 May, the first collecting site was Msua, some 60 km SW of Bagamoyo (Reichenow 1891a, 1894). Here, Emin collected a bird that Reichenow listed as *aureoflavus*, with a short description: "Length. 153 mm. Eye orange yellow; beak black; feet flesh-coloured". Later, he listed it under *holoxanthus* with no further comment other than "V" for May (Reichenow 1904, p 92), possibly due to its proximity to Mtoni. However, the eye colour in Reichenow (1891a) confirms that it was indeed *aureoflavus* (and the habitat at Msua does not appear suitable for *holoxanthus*—NEB). Due to confusion of the various similar weavers, Reichenow, Zedlitz and other authors probably did not appreciate the importance of eye colour of males in distinguishing *holoxanthus* from *aureoflavus*.

Both the Mtiras and Msua specimens are thus *aureoflavus* specimens, and Zedlitz did not distinguish *holoxanthus* simply because he never examined a *holoxanthus* specimen, and he certainly did not see the holotype.

The Ruvu Weaver is similar in plumage to the African Golden Weaver, and only two Ruvu Weaver specimens are known. The two ornithologists most familiar with the *holoxanthus* holotype had passed away (Hartlaub in 1900, and Shelley in 1910) by the time of Zedlitz's 1916 paper, otherwise they would probably have criticized his conclusions. It appears as if Reichenow did see the original *holoxanthus* specimens (see Measurements), but these were moved to Tring (and much later to AMNH).

In summary, a series of errors and a lack of critical thinking (Zedlitz), and confusion over the golden weavers caused the disappearance of the species.

Modern sightings and recognition of holoxanthus as a species

In 2003, Fiona Reid (FR) and her husband Graham were birding along the causeway of the Ruvu River floodplain west of Bagamoyo, Tanzania. They realized that the yellow weavers they were watching had dark eyes unlike the orange red eyes of the African Golden Weavers (*subaureus*) they were familiar with in Dar es Salaam. FR continued to watch these birds when conditions allowed and in 2006 shared her descriptions with the Tanzania birds Yahoo group which generated considerable interest and correspondence. In 2009 FR obtained reasonable photographs of these birds and shared these with Don A. Turner (DAT) and Brian Finch (BF) who were familiar with *P. bojeri* on the Kenyan coast. DAT raised the prospect of these birds being *holoxanthus* and BF noted the pale lower mandible of the females which resembled female *P. bojeri* and not those of *aureoflavus*.

In August 2013 NEB had the opportunity to watch and photograph these Ruvu River birds and begin to search for birds upstream of Mtoni. Colonies of known *aureoflavus* within a few kilometres of the Ruvu River were double checked and appeared to be species specific. In February 2013 Alastair Kilpin wrote to NEB regarding photographs of what he had assumed to be *P. bojeri* (but resembled *holoxanthus*) from Lake Tagalala in the Selous Game Reserve (also in PHOWN (PHOTOS of Weaver Nests)). Other observers have since submitted sightings and photographs to the Birding Tanzania Facebook group and there are now records from the Wami River by Friedeman Vetter (FV) and, more recently, from Morogoro where Thibaut Chansec and Lily Shallom have independently located small colonies of *holoxanthus*. Walter Jubber and P. Bennet had located further nest sites within the Selous Game Reserve and FV has located a colony on the south bank of the Rufiji River almost opposite a colony of *aureoflavus* on the north bank (all observations are mapped in Fig. 4). Turner & Kennedy (2019) briefly noted the loss of *holoxanthus* and called for a full systematic review of the taxon.

3. Current knowledge

Names

Scientific names assigned to this taxon include *Ploceus holoxanthus* (Hartlaub 1891), *Xanthophilus holoxanthus* (Shelley 1905) and *Sitagra holoxantha* (Sharpe 1909). Although this taxon is not listed in de Silva *et al.* (2019), their classification would place this species in *Malimbus*, while more recent phylogenetic work places this species in the genus *Textor* (Fjeldså *et al.* 2020, Olsson *et al.* in prep.). In this paper the more familiar and long-standing *Ploceus* is used as this paper provides background to the species (primarily known as belonging to *Ploceus*). The reintroduction of the genus *Textor*, however, is likely to become established following Fjeldså *et al.* (2020).

Shelley (1905) gave an English name, Bohndorff's Golden Weaver, after the collector. Currently, Tanzanian birders refer to it as Ruvu Weaver, after its distribution (originally suggested by Fiona Reid, and used in Mills & Leventis 2017), and we propose to keep Ruvu Weaver as its English name.

Measurements

Specimen measurements were given by Hartlaub (1891), Reichenow (1894), Shelley

(1905), and Hartert (1907). These were mostly stated, or implied, to refer to the male holotype individual. Shelley (1905), and presumably Hartert (1907), measured the wing of a female (Table 3).

Hartlaub (1891) provided wing and bill measurements of the male. Reichenow (1894) gave the same wing, but added total bird length, thus he presumably saw the holotype in the hand. Shelley (1905) added several measurements, although in inches. Discrepancies in measurements suggest that these different authors took their own measurements, and thus were familiar with the type specimens. Turner & Kennedy (2019) cited the measurements of Hartert (1907) but mis-cited the tail as 4.5 mm instead of 4.5 cm.

Identification/plumages

Hartlaub (1891) compared male *holoxanthus* with male *aureoflavus* collected from nearby Zanzibar. The primaries of *holoxanthus* are yellow, with the tips being a slightly darker shade, as is the first primary. The outer webs of the secondaries are also a slightly darker shade. In contrast, the wings of *aureoflavus* are pale olive with a yellow outer border and a broader yellow border along the inner webs. In addition, the feather shafts of the wing feathers are light yellow in *holoxanthus* and dark in *aureoflavus*. The back of *aureoflavus* is olive-green, which is hardly noticeable in the (yellow) back of *holoxanthus*. Finally, the golden-brown colour of the head in *holoxanthus* is decidedly more vivid than that of *aureoflavus*. Hartlaub listed the eye colour as dark brown in his Latin description, but did not comment on this being a distinguishing feature.

Shelley (1905) provided a detailed description of the female. He did not list distinguishing features, but mentioned the distinctive two-toned bill colour. Female *aureoflavus* is similar but in breeding females, *aureoflavus* is yellowish below and the bill horn coloured. Non-breeding *aureoflavus* females resemble *holoxanthus* females in underparts (greyish white) and two-toned bill, but the iris of *aureoflavus* is red-brown rather than brown (del Hoyo *et al.* 2010).

Table 3. Measurements of the Ruvu Weaver *Ploceus holoxanthus*; inches converted to millimetres by $\times 25.4$; ad = adult, m = male, f = female, where sex is not stated the presumed sex is placed in square brackets “[]”.

Measurement	Sex	Original	mm	Source
total length	Ad m	124 mm	124	Hartlaub(1891)
	[m]	L. 130	130	Reichenow(1894)
	Ad m	5 in	127	Shelley (1905)
wing	Ad m	70 mm	70	Hartlaub (1891)
	[m]	F. [=Flugel] 70 mm	70	Reichenow(1894)
	Ad m	wing 2.6	66	Shelley (1905)
	[m]	only 65 to 69 mm	69	Hartert(1907)
wing	Ad f	Wing 2.35	59.7	Shelley (1905)
	[f]	only 65 to 69 mm	65	Hartert (1907)
tail	Ad m	42 mm	42	Hartlaub (1891)
	Ad m	tail 1.7	43.2	Shelley (1905)
	[m]	only 4.5 cm	45	Hartert (1907)
bill	Ad m	14 mm	14	Hartlaub (1891)
	Ad m	culmen 0.65	16.5	Shelley (1905)
tarsus	Ad m	21 mm	21	Hartlaub (1891)
	Ad m	tarsus 0.85	21.6	Shelley (1905)

Table 4. List of published illustrations of the Ruvu Weaver *Ploceus holoxanthus*; all locations are in Tanzania.

Type	Depicting	Observer	Location	Date	Source
painting in publication	male	Henrik Gronvold (artist)	Mtoni	1905	Shelley (1905), Plate 42 Figure 1
photo in publication	male	Adam Scott Kennedy	Selous Game Reserve	Oct-08	Turner (2019), Figure 1
web photo	male, nest	Alastair Kilpin & Gavin Lautenbach	Lake Tagalala in Selous Game Reserve	09-Jan-13	http://weavers.adu.org.za/phown_vm.php?vm=5186
web photo	male, nests	Fiona Reid	Near Bagamoyo	30-May-13	http://weavers.adu.org.za/phown_vm.php?vm=5680
web photo	male, female, nests	Neil Baker	Ruvu Bridge at the end of the causeway	23-Jun-13	http://weavers.adu.org.za/phown_vm.php?vm=5911
web photo	male	Per Holmen	Bagamoyo	10-Jan-16	http://www.pers-birding-pages.com/www.pers-birding-pages.com/Ruvu_Weaver.html
web photo	female	Riaan Marais	Ruvu floodplain	Jul-18	http://www.tanzaniabirds.net/African_birds/weaver_ruvu/ruvu.htm

Several illustrations of *holoxanthus* have been published (Table 4). The holotype (male) was illustrated in a colour painting in Shelley (1905), and a photograph of a male was included in Turner & Kennedy (2019). Three records with photos have been uploaded to PHOWN.

We are aware of slight differences that can occur in the extent of facial orange within and between populations of male *aureoflavus*, *P. bojeri*, *P. castaneiceps* and *holoxanthus*. However, the dark brown eye of the male (Fig. 1) and the pale lower mandible of the female of *holoxanthus* (Fig. 2) distinguish this species from *aureoflavus*. The orange-red iris of adult male *subaureus* is noticeable throughout its range, whereas the orange wash on the face becomes fainter or absent further south (Fig. 3).

Figure 1. Adult male Ruvu Weaver *Ploceus holoxanthus*, 62km upstream of the type locality on the lower Ruvu River at Mtoni. Note the dark brown eye. There are also subtle differences from African Golden Weaver in bill shape and the extent of burnt orange on the face but these are difficult to quantify from photographs (photo: Riaan Marais).



Figure 2. Adult female Ruvu Weaver *Ploceus holoxanthus*, 62km upstream of the type locality on the lower Ruvu River at Mtoni. Note the pale lower mandible, a feature shared with Golden Palm Weaver *P. bojeri* but not with African Golden Weaver *P. subaureus* (photo: Riaan Marais).





Figure 3. Ruvu Weaver *Ploceus holoxanthus* and African Golden Weaver *P. subaureus* bathing side by side, Ruvu River 100km upstream of Mtoni, Tanzania, 12 September 2015. Left to right: female Ruvu Weaver, male Ruvu Weaver, male African Golden Weaver, Common Bulbul *Pycnonotus barbatus* (photo: Neil E. Baker). This September image is the only one we have of these birds side-by-side utilizing the same habitat (the non-breeding season), and there is still no evidence of them nesting close to each other.

Distribution

The Ruvu Weaver has been recorded on the Ruvu River up to 100km upstream, on the lower Wami River, and from Lake Tagalala to the Rufiji River in the Selous Game Reserve (Fig. 4). In contrast, populations of *aureoflavus* occur throughout eastern Tanzania.

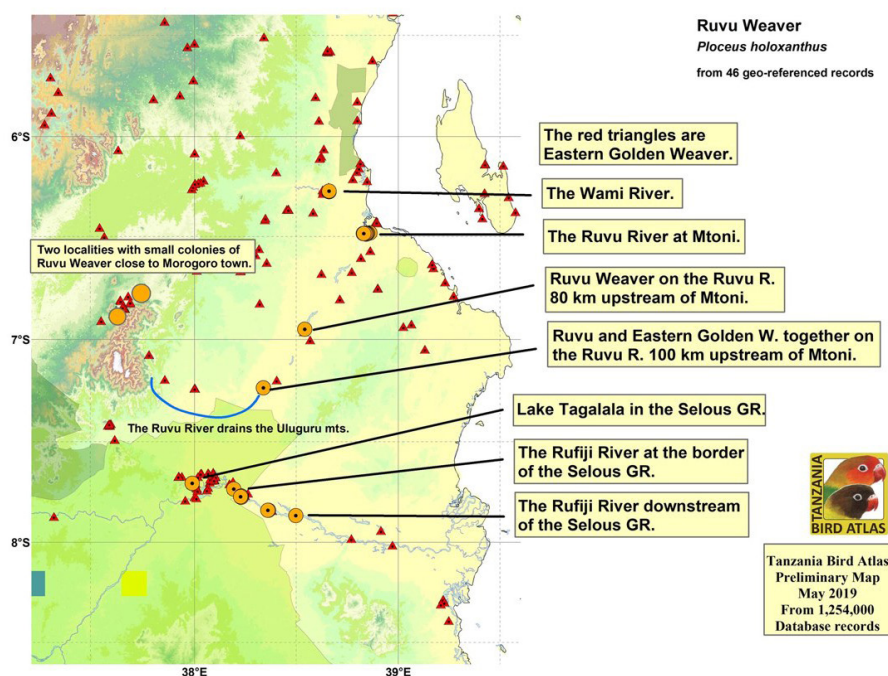


Figure 4. The restricted distribution of Ruvu Weaver *Ploceus holoxanthus* along the Ruvu, Wami and Rufiji rivers in eastern Tanzania. Known observations of the more widespread African Golden Weaver *P. subaureus* are also shown on this map indicating that this species is not restricted to river valleys. Note that some of these claims for African Golden Weaver may be older identification errors for Ruvu Weaver, especially in habitats where both may occur.

It appears for now that *holoxanthus* is restricted to the catchment of the Ruvu, Wami and lower Rufiji rivers in much the same way as Kilombero Weaver *P. burnieri* is restricted to the Kilombero River 150km upstream from Lake Tagalala (Baker &

Baker 1990). That both are surrounded by large populations of *aureoflavus* suggests that these river populations are in competition with *aureoflavus*. There is some evidence (Tanzania Bird Atlas data) that the population of *aureoflavus* is expanding but none, as yet, to suggest this threatens the far smaller populations of *holoxanthus* or *P. burnieri*.

Breeding biology

Although there are several photos of the nests of *holoxanthus*, there has been no formal description of the nest. From the photos, the nest shape is of the same type as *aureoflavus*, i.e., kidney-shaped with entrance below, and attached from the roof directly to stems. Compared to *aureoflavus*, however, the nest appears less tightly woven and is not as smooth on the outside, resembling the nests of its closest relatives *xanthopterus*, *bojeri* and *castaneiceps* (Olsson *et al.*, in prep.). Nests are placed in bushes or bamboos (photos), or in *Phragmites* (N. Baker), along rivers. Colony size was given as 15 nests in a tree (PHOWN number 5186).

Eggs from some nests have been photographed (Fig. 5). An egg from one nest was light blue with very faint mottling (egg 1), and an egg from a second nest was light brown, also with very faint mottling (egg 2). These two eggs were photographed against 1 x 1 mm grid paper, allowing the following measurements to be determined: egg (1) 21 x 15 mm, and egg (2) 19 x 14 mm.



Figure 5. Two eggs (from different nests) of the Ruvu Weaver *Ploceus holoxanthus* (photo: Judith Jarvis).

Molecular phylogenetics

A molecular phylogeny of the Ploceidae was carried out at the University of Gothenburg (Fjeldså *et al.* 2020; Olsson *et al.*, in prep.) and included samples of *holoxanthus*. Contrary to all the early accounts reviewed above, *holoxanthus* is not closely related to *subaureus* (*P. aureoflavus*), which belongs to a distant branch of masked weavers. Instead, *holoxanthus* is the sister species of Southern Brown-throated Weaver *P. xanthopterus*, and they form a clade with, perhaps less surprisingly, *P. bojeri* and *P. castaneiceps* (Fjeldså *et al.* 2020). The females of these four recently diverged weaver species have a two-coloured bill. Fjeldså *et al.* (2020) and Olsson *et al.* (in prep.) firmly reject a close relation with *P. subaureus* and give cause to recognize *holoxanthus* as a valid species.

Conservation status

We have, for now, little to say on the conservation status of this population. Numbers appear to be quite low in the areas we have investigated to date and would suggest a maximum population in the low thousands. Some 140 km upstream of Mtoni a large reservoir is being discussed to provide a constant water supply to Dar es Salaam. Should this project proceed it is likely that the more open habitat would favour colonization by *aureoflavus* rather than *holoxanthus*.

Conclusion

The observations by Fiona Reid of *Ploceus holoxanthus* in the early 2000s have subsequently been confirmed by numerous photos (most unpublished). Mills & Leventis (2017) listed *holoxanthus* as a species, and Turner & Kennedy (2019) drew further attention to the taxon, calling for a full systematic review. A recent molecular phylogeny of the Ploceidae (Fjelds  et al. 2020) refutes any close relationship with *subaureus* and places *holoxanthus* as a distinct lineage.

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