

Evaluation of the Food of Red-Billed Quelea During Dry Season in Gyawana Ecosystem and Environs

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Abstract: Study on the food items of Red-billed Quelea (*Quelea quelea*) during dry season in Gyawana ecosystem and environs, Adamawa State, Nigeria, was carried out to ascertain the grains the birds foraged on during the dry season. The bird's crop contents were analysed. Eighteen (18) different food items were identified which including seeds of different grasses, cultivated cereals, insect remains and Grits from the crops of one hundred and fifty (150) *Quelea quelea* birds sampled during the study period. In terms of frequency and magnitude of occurrence in the feed, *Oryza barthi* appears to be the most consumed food of Red-billed Quelea with (43.4%) total prevalence, followed by *Oryza sativa* (39.24%), *Digitaria iburua* (16.69%), *Sorghum bicolor* (9.11%), *Dactyloctenium aegyptium* (8.92%), *Setaria pallide-fusca* (7.60%), *Brachiaria mutica* (3.92%), *Eragrostis tremule* (2.77%), *Digitaria ciliaris* (0.93%), *Chloris pilosa* (0.85%), *Roetboellia exaltata* (0.80%), *Echinochloa colonum* (0.72%), *Cenchrus biflorus* (0.63%), *Panicum urvilleanum* (0.32%), *Sacciolepis africana* (0.23%), *Schoenefeldia gracilis* (0.17%), Grits (0.15%), and insects remained (0.07%). The analysis of variance was used to compare the mean number of various seeds consumed by the Red-billed Quelea during the period of study. The result shows no significant difference in the food items consumed by Red-billed Quelea during the dry season. The researchers therefore, recommend that further study should be carryout on the food items of *Quelea* birds (*Q. quelea*) during off cropping and raining season, also study should be carry out on Biological control of this *Quelea* birds (*Q. quelea*).

Key words = Food items, Red-Billed Quelea, Gyawana, Ecosystem, Environs, Dry Season,

I. INTRODUCTION

The Red-billed Quelea is a small gregarious Afro-tropical weaver bird (Doggett, 1988). The birds live and breed in huge flocks mostly in grassland regions. They are also recorded in other vegetation types but not in rain forests. The species prefers woodlands and grass lands at any altitude below 2000m. Despite its prevalence in ranges dominated by grass matrix, it breeds only in such ranges that have thorny or spiny vegetation (Clancey, 1964; Borello and Cheke, 2011). In Nigeria, *Quelea quelea* are found in upper Sudan zone, Sahelian or thorny scrub woodland. They are particularly predominant in Borno, Yobe, Adamawa, Sokoto, Jigawa and Kano State (Walter, 1971; Safford, 2013). Vegetation and floristic composition is not uniform throughout Borno State. The distribution range of the Red-billed Quelea covers most

of sub-Saharan Africa, excluding the rain forest areas and parts of South Africa (Craig, 2010).

Red-billed Quelea usually flocks in groups and may number about hundreds of thousands per group, feeding usually on cereal crops. It is in such numbers that they swoop on mature cereal crops in the field (BirdLife International, 2013). Three sub-species have been reported in the African continent. These are: *Quelea quelea aethiopica* which occur in the north-eastern quadrant of Africa. *Quelea quelea lathamii* in Zambia, Zimbabwe and Malawi and *Quelea quelea quelea* in West Africa (Yaji *et al.*, 2002; Craig, 2010). The Red-billed Quelea belongs to Class: Aves, Order: Passeriformes, Family: Ploceidae, Genus: *Quelea*, species *Quelea quelea*. Its common name is the Red billed Quelea or the Black faced Dioch (GTZ, 1987).

The distinguishing features of the bird are its size which on the average is about 12.5cm in length and weighs 15-20g (BirdLife International, 2013); its color which during breeding the male adorns a more colorful plumage and red-bill generally. (Ezealor and Gile, 1997; Yusufu *et al.*, 2004a). The male may also wear a facial mask which varies in color from black to white, a breast and crown plumage which could also be yellow or bright red. For the rest of the year male plumage resembles that of the female, which is a cryptic beige coloration. The female bill is yellowish during breeding and red during the nonbreeding season (BirdLife International, 2013).

Despite floristic differences between regions, the physiognomic nature of the plants cover is thorn wood land. This makes the state predisposed to *Quelea quelea* habitation. Over the years there has been frequent cereal crop depredation in the state by the grainvorous quelea birds. The effects have been disastrous to the point that relief materials have had to be distributed to affected areas in some cases (Audu, 2019). Its chemical control is a threat to life, in 2008; three Councils Staff were hospitalized due to the inhalation of the Avitoxic used to control the Birds in Konduga Local Government Area of Borno State (Ndahi, 2008). Recently, on the 20th January, 2022, there was *Quelea quelea* invasion in Firgi and environs, Gwoza Local Government Area of Borno State, that cause serious devastation to their *sorghum bicolor* (Massakwa). So far nothing has been reported in the area of "lure food items and their effect in mitigating Red-billed quelea (*Quelea*



Plate II: Quelea birds in transparent container ready for Sacrifice

Field Source: 2021



Plate III: Sacrificed Quelea birds ready for dissection to obtain birds crops

Field Source: 2021

Analysis Of The Crop Contents.

In the laboratory the crop contents (seeds of different cereal crop, grasses, insects and grit) were sorted out based on their physical characteristics using visual observation with the aid of magnifying lens. These seeds, insects and grits were counted and recorded. Some of the physically unidentifiable foods items especially seeds were sown in sterilized soil in a germinating tray placed in a glass house and watered daily to enable them germinate. Where germination occurred, the plants were nursed to flowering for further identification. The germinated plants and the food items found in the birds' crops were identified with the help of preserved specimens in the herbarium in the Department of Botany, Adamawa State University Mubi and some identification were also done in Department of Biological Sciences, Ahmadu Bello University, Zaria.

Statistical Analysis

Data obtained were analyzed by one way analysis of variance (ANOVA), followed by Duncan's Multiple Range Test (DMRT) for means separation. Student t-test was used to test

for difference between the male and female food items consumed by the birds. Using a statistical software package (SPSS for Windows). The results were presented as mean \pm standard error and $P > 0.05$ was regarded as not statistically different.

III. RESULTS

From the crops of one hundred and fifty (150) Red-billed Queleas sampled during the period of study, eighteen (18) food items of different seeds, insects and grits were obtained and are presented in Tables 1- 4.

Crop contents of Red-billed Quelea for the month of December 2021

For the month of December, out of the 25 females and 25 males Red-billed Quelea sampled, the crop contents examined reveals *Oryza sativa* was the most consumed food item with a mean of 130.56 ± 2.04 (71.29%) for females and, 132.84 ± 3.72 (71.39%) for males. This was followed by *Oryza barthi* with a mean of 24.12 ± 1.21 (14.39%) for females, 25.16 ± 2.16 (15.60%) for male and the least consumed seed for this month for both male and females was *panicum urvilleanum* with a mean of 0.26 ± 0.13 (0.14%). It was also found that female Quelea birds consumed thirteen different food items including insects in the month of December and male Quelea birds consumed twelve different food items as shown in Table 1.

Crop contents of Red-billed Quelea for the month of January, 2022.

In the month of January, there were nine different food items including cereal crop, grass seed, grit and insect remains recovered in the crop of Quelea birds sampled in this study. *Oryza barthi* was the most preferred grass grain in this month as seen in Table 2, with a means of 91.04 ± 1.77 (73.32%) for females, 89.48 ± 1.81 (72.97%) for males. This was followed by *Sorghum bicolor* with 15.76 ± 0.410 (12.63%) for females and 14.48 ± 0.52 (11.86%) for males, while *Sacciolepis africana* was the least consumed food item, with the means of 0.08 ± 0.08 (0.64%) for females and 0.44 ± 0.31 (0.36%) for males. There was *Cenchrus biflorus* found in the crop of male Quelea birds sampled in this month but absent in female crops. Insect remained was also recovered in the crop of female Quelea birds sampled in the month of January.

Crop contents of Red-billed Quelea for the month of February, 2022.

Ten different food items were consumed in the month of February by the Quelea birds. Nine different food items including insects' remains and grit were consumed by female Quelea birds in the month of February, while seven different food items were consumed by male Quelea birds. *Digitaria iburua* was the most consumed grass grain having the highest mean of 33.52 ± 3.64 (42.49%) by females and 30.68 ± 2.76 (41.17%) by males. Followed by *Dactyloctenium aegyptium* with mean 27.54 ± 2.12 (35.04%) in female, and 25.42 ± 2.15 (34.14%) in males. The least consumed food item

in the month of February was *Echinochloa colonum* with 0.56± 0.52 (0.66%) in both male and female Quelea birds.

There was insect's remained in the crop of female Quelea birds sampled while absent in male's crops as seen in Table 3.

Table 1. Food items obtained from the crops of Red-billed Quelea for the month of December, 2021. (Number of Seeds, Grits and Insect remains)

Food Item	♀ Total (%)	Mean± S.E	♂ Total (%)	Mean± S.E
Brachiaria mutica	76 (1.68)	3.04 ± 1.01	86 (1.87)	3.44 ± 1.09
Cenchrus biflorus	40 (0.88)	1.60 ± 0.93	27 (0.59)	1.08 ± 0.74
Chloris pilosa	83(1.83)	3.32 ± 1.37	45 (0.98)	1.8 ± 1.01
Sorghum bicolor	287(6.33)	11.48 ± 1.30	324 (7.06)	12.96 ± 1.12
Echinochloa colonum	33 (0.73)	1.32 ± 0.74	75 (1.63)	3 ± 1.14
Grit	6 (0.13)	0.24 ± 0.13	4 (0.09)	0.16 ± 0.16
Insects	5 (0.11)	0.2 ± 0.14	0 (0.00)	0.00 ± 0.00
Oryza barthi	653(14.39)	156.12 ± 2.37	679 (14.80)	167.16 ± 2.46
Oryza sativa	3239(71.29)	130.56 ± 2.04	3271(71.39)	132.84 ± 3.74
Panicum urvilleanum	7 (0.15)	0.28 ± 0.19	7 (0.15)	0.28 ± 0.19
Sacciolepis Africana	12 (0.26)	0.48 ± 0.27	10 (0.22)	0.4 ± 0.22
Setaria pallido-fusca	65 (1.43)	2.60 ± 0.53	53 (1.16)	2.12 ± 0.55
Schoenefeldia gracilis	16 (0.35)	0.64 ± 0.27	9 (0.19)	0.36 ± 0.20

P > 0.05

Key: ♀ = Female, ♂ = Male

Table 2: Food items Recovered in the crops of Red-billed Quelea for the month of January, 2022. (Number of seeds, Grits and Insect remains)

Food Item	♀ Total (%)	Mean± S.E	♂ Total (%)	Mean± S.E
Brachiaria mutica	40 (1.28)	1.6 ± 0.89	51 (1.67)	2.04 ± 0.96
Cenchrus biflorus	0 (0.00)	0.00 ± 0.00	27 (0.59)	1.08 ± 0.74
Sorghum bicolor	394 (12.63)	15.76 ± 0.410	362 (11.86)	14.48 ± 0.52
Grit	4 (0.13)	0.16 ± 0.11	4 (0.09)	0.16 ± 0.16
Insects	2 (0.64)	0.08 ± 0.08	0 (0.00)	0.00 ± 0.00
Oryza barthi	2276 (72.97)	91.04 ± 1.77	2237 (73.32)	89.48 ± 1.81
Roetboellia exaltata	58 (1.86)	2.32 ± 0.39	62 (2.03)	2.48 ± 0.51
Sacciolepis africana	2 (0.06)	0.08 ± 0.08	11 (0.36)	0.44 ± 0.31
Setaria pallide-fusca	343 (10.99)	13.72 ± 1.11	679 (14.80)	27.16 ± 2.46

P > 0.05

Key: ♀ = Female, ♂ = Male

Table 3. Food items observed in the crops of Red-billed Quelea for the month of February, 2022. (Number of seeds Grits and Insect remains)

Food Item	♀ Total (%)	Mean± S.E	♂ Total (%)	Mean± S.E
Brachiaria mutica	134 (6.79)	5.36 ± 1.91	144 (6.14)	4.56 ± 1.68
Dactyloctenium aegyptium	691 (35.04)	27.64 ± 2.34	635 (34.18)	25.4 ± 2.85
Digitaria ciliaris	67 (3.39)	2.68 ± 1.29	73 (3.93)	2.92 ± 1.37
Digitaria iburua	838 (24.62)	33.52 ± 3.64	765 (41.17)	30.68 ± 2.76
Echinochloa colonum	13 (0.66)	0.52 ± 0.25	0 (0.66)	0.52 ± 0.25
Eragrostis tremula	202(10.24)	8.08 ± 2.54	214 (11.52)	8.56 ± 2.91
Grit	5 (0.25)	0.2 ± 0.14	0.00 (0.00)	0.00 ± 0.00
Insects	4 (0.20)	0.16 ± 0.16	0(0.00)	0±0.00
Oryza barthi	18 (0.91)	0.72 ± 0.23	23 (1.24)	0.92 ± 0.29
Panicum urvilleanum	0 (0.00)	0.00 ± 0.00	34 (1.83)	1.36 ± 0.67

P > 0.05

Key: ♀ = Female, ♂ = Male

Table 4: Summary of the food Items observed in the Crops of Red-Billed Quelea Sampled from December – February

Food item	N	Total (%)	Mean + SE	Min	Max
Brachiaria mutica	150	531(3.94%)	3.54±0.63	3	63
Cenchrus biflorus	150	67(0.63%)	8.84 ±1.72	0	31
Chloris pilosa	150	128(0.85%)	1.06 ±2.6	0	62
Dactyloctenium aegyptium	150	1326(8.92%)	8.94 ±1.31	0	74
Digitaria ciliaris	150	140(0.93%)	0.93 ±1.72	0	30
Digitaria iburua	150	1603(16.69%)	10.69 ±3.04	9	69
Echinochloa colonum	150	121(0.72%)	1.21 ±1.09	2	23
Eragrostis tremula	150	416(2.77%)	2.77 ±0.91	0	51
Oryza barthi	150	6510(43.4%)	43.4 ±2.40	6	94
Oryza sativa	150	5886(39.24%)	39.94 ±1.82	0	103
Panicum urvilleanum	150	48(0.32%)	0.37 ±1.01	0	19
Roetboellia exaltata	150	120(0.80%)	2.40 ±1.41	0	11
Sacciolepis africana	150	35(0.23%)	0.35 ±0.08	0	15
Schoenefeldia gracilis	150	25(0.17%)	0.50 ±1.12	0	25
Setaria pallidofusca,	150	1140(7.60%)	11.4 ±1.32	0	24
Sorghum bicolor	150	1367(9.11%)	13.67 ±0.84	0	78
Grit	150	23(0.15%)	0.15 ±0.72	0	4
Insect	150	11(0.07%)	0.14 ±1.41	0	3

P > 0.05

IV. DISCUSSION

The result of this study shows that the Red-billed Quelea (*Quelea quelea*) consumed thirteen different food items including insects remained and grit in the month of December. *Oryza sativa* was the most consumed, followed by *Oryza barthi* and the least consumed seed was *Panicum urvilleanum*. Insects and grits were consumed in small quantities. The high number of food items consumed in this month may be due to the availability of these foods and the scarcity of the other food items in the study area. The result of this study is in line with the results of Yusuf *et al.* (2004a), who reported that food of Quelea birds during the early dry season in the months of November – December in Borno State include; *Pennisetum glaucum*, *Tetrapogon aestevum*, *Echnochloa colonum*, *Schoenefeldia vulgare*, *Oryza. barthi* and sand. Furthermore, in their work, they reported the consumption of uncultivated food types as significantly higher than cultivated food types. This means that cultivated crop would be less vulnerable when uncultivated grass seed are available. The differences in the food items observed in this study with those reported by other researchers may be as a result of the different crops cultivated in which the studies were carried out. During the period of November – December, cultivated crops such as *Pennisetum glaucum* were abundantly available to the birds since harvesting was still on in Borno State, while in Gyawana, Adamawa State, *Oryza sativa* was also abundantly available in the vicinity of the birds since

harvesting was still on. It may also be due to the geographical location and the few numbers of birds the researchers used.

Insects remained were consumed by female Red-billed Quelea (*Quelea quelea*). This may be due to the female birds' requirement of animal protein for egg formation. Welty and Baptista (1990) stated that relatively larger amounts of animal materials consumed by females birds are vital to egg formation as well as the accumulation of body fats that are metabolized during incubation and chick rearing. Yusuf *et al.*, (2004c), reported that female birds consumed more animal food than males during pre-breeding times, for egg-making and during breeding to withstand the stress of brooding and for feeding their nestlings.

There are nine different food items including seed, grit and insect remains recovered in the crop of Quelea birds (*Quelea quelea*) sampled in the month of January. Eight different food items including seed and grit were recovered in the crop of male Quelea birds. Also eight different food items including seed, insects remained and grit was recovered in the crop of female Quelea birds sampled in this month of study. *Oryza barthi* was the most preferred food item in the month of January, as presented in Table 2, with a means of 91.04±1.77(73.32%) for females, 89.48±1.81(72.97%) for males. This was followed by *Sorghum bicolor* with 15.76±0.410 (12.63%) for females and 14.48±0.52 (11.86) for males, while *Sacciolepis africana* was the least consumed food item, with the means of 0.08 ± 0.08 (0.64%) for females and 0.44±0.31 (0.36%) for males. There was *Cenchrus*

biflorus found in the crop of male Quelea birds sampled in this month but absent in female crops. The findings of this study also reveals that there was *sorghum bicolor* in the crop of Quelea birds in the month of January, this concur with the findings of Ozolua (1986), who reported that grainvorous birds generally prefer wild seeds and tend to go for cultivated cereal crops when the grass seeds are in short supply. There was only few number of *sorghum bicolor* which is the cultivated grain observed in the crop of the Quelea birds sampled in this month. The findings of the present study therefore agree with (Jackson 1973; Yusuf *et al.*, 2004b), who reported that there are naturally preferred foods of the Red-billed Quelea. This also suggests that species of Quelea may prefer their natural food (wild grain seeds) to cultivated grains. (Brugger and Jaeger 1982; Robert *et al.* 2007 and Buba *et al.* 2013), reported that wild annual grasses form the bulk of the diet of Quelea birds (*Quelea quelea*).

In the month of February ten different food items were consumed by the Quelea birds (*Quelea quelea*). Female Quelea birds consumed nine different food items including insects' remains, while male Quelea birds consumed seven different food items. *Digitaria iburua* was the most consumed grass grain having the highest mean of 33.52 ± 3.64 (42.49%) by females and 30.68 ± 2.76 (41.17%) by males. Followed by *Dactyloctenium aegyptium* with mean 27.54 ± 2.12 (35.04%) in female, and 25.42 ± 2.15 (34.14%) in males. The least consumed food item in the month of February was *Echinochloa colonum* with 0.56 ± 0.52 (0.66%) in both male and female Quelea birds. There was insects remained and grit in the crop of female Quelea birds and Seed of *Panicum urvilleanum* in male's crops. All the food items consumed in this month were wild grass seed with the exception of the grit and insect remained as shown in Table 3. The result of this study concur with the findings of Ward (1965; Yusuf *et al.*, 2004c; Buba *et al.*, 2013) who reported that Quelea are not usually entirely dependent upon cereal crops for food. In fact there are often periods when Queleas ignore crops or cause only negligible damage to them. They prefer the small seeds of wild grasses and when these are available and abundant, the birds do not attack cereals. The present study has shown that Quelea birds consumed only wild grass grains and survived and lived on them comfortably in this month.

In conclusion, the study on the food items of Red-billed Quelea (*Quelea Quele*) from December, 2021 – February, 2022, it was reveal that *Oryza barthi* was the most preferred seed foraged upon by Red-billed Quelea (*Quelea Quele*) during the period of this research work in Gyawana and its environs Adamawa State of Nigeria. This might be due to the fact that it was found throughout the bird's vicinity, although it varied in quantity in the crops of the Red-billed Quelea. The least consumed seed was found to be *Schoenefeldia gracilis* (0.17%). grit was observed in both male and female Red-billed Quelea throughout the study period, while insects remained was observed only in female Red-billed Quelea. The following food items: *Brachiaria mutica*, *Cenchrus biflorus* *Chloris pilosa*, *Dactyloctenium aegyptium*, *Digitaria*

celiaria *Digitaria Iburua*, *Echinochloa colonum*, *Oryza barthi*, *Oryza sativa*, *Panicum urvilleanum*, *Roetboellia exaltata*, *Sacciolepis Africana*, *Setaria pallide-fusca* and *Sorghum bicolor* were also observed in the crops of Red-billed Quelea (*Q. Quele*) sampled for this research work.

From the outcome of this study, the researchers, therefore suggests the following recommendation:

- That further studies should be carried out during off-cropping season and also raining season to find out the food items consume by Red-billed Quelea (*Q. Quele*).
- Farmers should leave some uncultivated portion of land between their farms, to enable these wild grass seeds grow, so that they may divert the attention of the birds from their cultivated crops during cropping seasons.
- That further studies should be carried out on biological control on Quelea birds, by the reintroduction of their predators such as the Red-necked Falcon *Falco chicquera* into the area.

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