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**Population size, Nest record and assessment of Community attitude
towards White Winged flufftail (*Sarothrura ayresi*) at Barga Wetland
in Adea Barga Woreda, West Showa, Oromia.**

MSc Thesis

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Addis Ababa, Ethiopia



Statement of Certification

This is to certify that Diribi Defar Bodena has carried out his research work on the topic entitled “Population Size, Nest Record and Assessment of Community attitude towards White Winged flufftail (*Sarothrura ayresi*) at Barga Wetland in Adea Barga Woreda, West Showa, Oromia .The Work Is Original in nature and is suitable for submission for the award of Master Degree in Zoological Science MSc.

Advisor:

Date:



Statement of declaration

I, the undersigned, declare that this study is my original work and has not been presented for a degree in any other university, and that all sources of materials used for the study have been duly acknowledged.

Declared by:

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Abstract

The white winged flufftails was first identified in the Ethiopian highlands, 10- 15 pairs bred at Sululta in the late 1990s and later on new breeding sites were recognized with 200 pairs at Barga floodplain. The present study was carried out in the Barga wetland which is found in Adea Barga District, West Showa Zone, Oromia region, Ethiopia. The population size, habitat preference; breeding, diurnal activity patterns, feeding ecology and attitude of local people towards White Winged flufftail were studied. Total count method was employed to study population size. Breeding season was studied by locating and following active nests throughout the study area. Instantaneous scan sampling technique was used to study their daily activity patterns and foraging behaviour. Questionnaire was used to study the attitude of the local people towards the wetland and White Winged flufftail in Barga wetland, highest population (18-20 individuals) was estimated in August and lowest (8-9) individuals in May. White Winged flufftail were more abundant during the wet season than during the dry season. The active breeding season was from June to August with majority (55%) of the nests built on underground and 40% in Shallow water. Nest materials used by White Winged flufftail were grass leaf, grass and feather. The mean clutch size of White Winged flufftail was 4. White Winged flufftail spent most of their time resting (45.6%), followed by foraging (36.76%). They spent 7.67% in comfort movement (preening or stretching). The rest of their time was allocated for locomotion (4.88%), vigilance (2.75%), and social behavior (1.59%) and in other activities (2.33%). White Winged fluff tails in Barga wetland were observed feeding on a wide variety of food items, including Insects, crustaceans, and plant seeds. The most frequently used foraging habitat of White Winged flufftail was Sedges (72.7%), followed by forbis habitat (16.52%), shallow water (10.78%) during the dry season. During the wet season, the most frequently used habitat of foraging was shallow water (52.54%), followed by Sedges (35.64%), and forbis (11.82%). Out of 230, 68 (30%) of the respondents mentioned that population of white winged flufftails had increased. 108 (46.9%) of the respondents explained that the number of the species has decreased, and 54 (23.4%) of the participants said that population status of the white winged flufftails remained unchanged. Majority of the local farmers in Barga wetland had positive attitude towards the wetland habitats. However, few of them consider White Winged flufftail as a pest causing grass damage. Barga wetland is the main roosting and feeding site for White Winged flufftail and other birds. However, agricultural expansion, overgrazing and human population growth have negative impacts on the wetland habitats. Local communities are accustomed to cutting grass from the area during the breeding season for coffee ceremonies. Hence, conservation and intervention is required to mitigate these pressures on the habitat and the birdlife in this area. From the study it is recommended that, the Barga wetland habitat, grazing inside the wetland should be controlled.

Keywords: Barga wetland, diet, Foraging White Winged flufftail



ACRONYMS AND ABBRVIATIONS

AEWS	Agreement on the Conservation of African-Eurasian Migration Water Birds
BLI	Birds Life International
CMS	Convention on the Conservation of Migratory Species wild of Animals
CR	Critically Endangered
EN	Endangered
EPA	Environmental Protection Authority
EWCA	Ethiopian Wild Conservation Authority
EWNHS	Ethiopian Wild Life Natural History Society
IBCR	Institute Biodiversity Conservation and Research
IUCN	International Union Conservation of Nature and Natural resource
CMS	Conventional on the Conservation of Migration Species of Wild Animals
MPT	Middle punts Wetland Trust
SSG	Site Supporting Groups
WWF	White Winged Flufftail



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CHAPTER -ONE

1. BACKGROUND OF THE STUDY

1.1 INTRODUCTION

Ethiopia's avifauna is numerous and is highly pronounced for its diversity and distribution (Anon, 2006). For this reason, more recently, Ethiopia has become the leading birding destination as compared to other African nations (Johan and Johan, 2009). Primarily, this is attributed to the presence of diverse climatic and agro-ecological regions in Ethiopia (Asefa, 2015). So far, it is believed that over 900 bird species are known to occur in Ethiopia. Out of 862 bird species, 17 are found exclusively within the country's boundaries or are endemic (Spottiswoode and Mills, 2000). Despite their distribution and diversity, the avifaunas of Ethiopia are poorly known as compared to many parts of Africa. Knowledge on the distribution of many birds is scattered throughout literature and even, for some studied bird species, their biology is not well documented.

Among wetland migratory bird species in Ethiopia, the one whose biology is relatively well studied and documented is the white winged Flufftail (*Sarothrura ayresi*). The species belongs to the Family *Rallidae*, Genus *Sarothrura* (Taylor and van perlo 1998, Taylor 1998, 1999).

The White-winged Flufftail (*Sarothrura ayresi*) was first described in 1877 by Gurney as *Coturnicops ayresi* in South Africa (Dowsett and Forbes-Watson, 1993). It was later placed in the genus *Sarothrura*. *Sarothrura ayresi* is under the Order *Gruiformes* and the Family *Rallidae*. The birds in Ethiopia were first described in 1911 by Bannerman as *Ortygops-macmillani* (Sibley and Monroe, 1993). The bird is also called the White-winged Crake. In Afan Oromo, the local language spoken in the regional state where the bird occurs in Ethiopia, (Barga), it is referred to as Simbirroo Barga, which is literally translated as the bird of Barga. Barga is the name of the river that runs through the birds' wetland habitat at this locality. The genus *Sarothrura* comprises seven species that are all found in Africa. *Sarothrura ayresi* is the only flufftail with white wing patches on its



inner flight feathers or its' secondary's. The adult males have a chestnut head, upper back and breast, while in the female this coloration is restricted to the neck and sides of breasts (Keith, 1986). Both sexes have a black-barred chestnut tail and white wing-patches on the secondary flight feathers.

The white winged fluffail was first identified in the Ethiopian highlands, 10- 15 pairs bred at Sululta in the late 1990s (Atkinson et al., 1996; Anon. 1997) and later on new breeding sites were recognized with 200 pairs at Barga floodplain in 1997 (Anon. 1997; Wondafrash, 2007). In 2005, a small breeding population was discovered at Bilacha in Ethiopia (Wondafrash in litt. 2007), with three adults recorded initially in July, followed by the location of three eggs in August and 19 nests in September (Anon. 2006). However, surveys at Bilacha and Woserbi since 2007 have found no evidence of breeding at either site. Bilacha in particular is highly overgrazed, with one bird seen in 2010 the only recent record, and Woserbi is thought to support a maximum of 1-2 pairs (Abebe in litt. 2024). At Barga, the average number of birds flushed annually since 2007 was just four, and two days of intensive searching in August 2013 located only 12 individuals in suitable habitat now limited to 300 ha (Abebe and Gebreselassie in litt. 2024). Although there are many wetlands in the Ethiopian highlands similar in altitude and vegetation to Barga, almost all have become unstable owing to overgrazing and monitoring of wetlands in the vicinity of Barga and Woserbi has failed to produce any records (Abebe and Gebreselassie in litt. 2024). The Area of occupancy is estimated at just 5.5 km² at the three Ethiopian breeding sites in 2013 (based on 150 ha of suitable habitat at Woserbi, 100 ha at Bilacha, and 300 ha at Barga (Smit-Robinson in litt, 2013), and searches of apparently similar sites nearby have failed to find the species (Collar, 1985).

The species has a seemingly disjunct range, being found north of the equator in Ethiopia, and south of it in Zambia, Zimbabwe and South Africa. The only breeding records are from highland marshes of central Ethiopia. It is a very local and apparently seen only in summer by visitors to highland marshes south of the equator. It is unknown whether the northern and southern populations are distinct, but their physical features appear identical. The birds are not resident in any of the few known sites, sometimes departing



after as little as six weeks when conditions turn unfavorable. The species was first found to breed at the Barga wetlands in 1997. In Ethiopia, the white winged flufftail, *Sarothrura ayresi* under the Family *Rallidae* and Ankober Serin, *Serinus ankoberensis* under the Family *Fringillidae*, are Endangered (EN) bird species of Ethiopia (IBA information and Fact Sheet 2002). In particular, the white winged flufftail is listed as Critically Endangered (CR) as its population is now thought to be very small (Anon, 2006).

In South Africa, there are six Important Bird Areas (IBAs) that are the homes of various kinds of avian populations including the African rarest and Endangered white winged fluff tails (*Sarothrura ayresi*). These wetland spans with their site codes (SC) are: Steenkampsberg (SA016), Grassland (SA125), Bedford-Chatsworth (SA043), Murphy's Rust (SA045), Franklin Vlei (SA081) and penny park (SA083), in South Africa the species are regular at the Dullstroom and wakker stroom marshes, where public access is strictly regulated. Non- breeding birds call only at dawn and dusk, sometimes in duet. Their natural habitat is seasonal marshland of subtropical or tropical high- altitude grassland. There is growing concern for the future of the white-winged fluff tail. Bird life South Africa and Middelput wetland Trust (MWT) have rolled out a number of research projects during 2012 and 2013 to focus on the conservation of the white-winged fluff tail. All the research findings have indicated that better understanding of the white winged fluff tail's movement and its habits demands connection and joint works between South Africa and Ethiopia which would in turn provide ground to implement correct conservation measures (MWT). A survey of suitable wetland habitat in South Africa is also currently underway and will contribute to a better understanding of the extent of its occurrence in the country. Whether a single population migrates between Ethiopia and South Africa, or each country hosts its own subpopulation, is still not known (Taylor and van perlo 1998), although observations from a breeding site in Ethiopia discovered in 2005 show that birds continue to breed in to the dry season and may remain in Ethiopia after breeding, rather than migrate (Anon.2006). A genetic and isotopic analysis is in progress to assess whether the species is migratory (Smit-Robinson, 2014).



The white-winged flufftail (*Sarothrura ayresi*) is a very rare African bird in the family *Sarothruridae*. The estimated global population size of white-winged flufftails is less than 250 adults. These birds reside in Ethiopia and South Africa but it is unknown whether these populations are one large or two different populations (Bowyer-Bower, 1996).

Their habitat consists of high altitude seasonal marshland with high sedge cover to protect their ground nests. Habitat loss is the main problem facing these birds as they require highly specialized habitat. These marshlands are being destroyed for a number of reasons such as, farming, grazing and sedge harvesting, but some efforts are being taken to protect the white-winged flufftail (Chapman, 2011).

1.2 Statement of the problem

Even though natural resources in Ethiopia have great contribution for the development of tourism in general and ecotourism in particular, most of natural resources are highly exposed to degradation. In relation to resource depletion, Drummod, M. 2013 had clearly stated that Ethiopians are facing rapid deforestation and land degradation that has been fueled by increasing of population which in turn resulted in extensive forest clearing for agricultural use, overgrazing, exploitation of existing forests for fuel wood, fodder and construction materials, setting of fire to create pasture land, expansion of settlements etc.

Barga wetland /Barga Floodplains/ is widely known breeding site for the white winged fluff tail which has retained its Critically Endangered status since 2014. The population is now thought to be very small, and is believed to be undergoing a very continuing decline of its extent, area and habitat, seasonal marshland primarily by the activity of man. Therefore, assessing of community attitude towards white winged flufftail (*Sarothrura ayresi*) is very important to initiate and design participatory community based management strategies.

Birds are particularly susceptible to habitat destruction and alteration due to changes in the availability and abundance of food as well as nesting and safe-resting sites, with profound impacts on white winged flufftail (*Sarothrura ayresi*) (Drummod, 2013).



Reductions of vegetation cover due to overgrazing or deforestation and changes in soil properties from trampling or agricultural intensification can have severe impacts on vegetation structure and composition and subsequently bird assemblages. Any activity which results in habitat modification has the potential to significantly impact on bird assemblages.

Mainly through agricultural and settlement expansion, overgrazing and deforestation (OFWE-IAB, 2016), all of which could have a profound effect on the biodiversity in general and white winged flufftail (*Sarothrura ayresi*) found in the area. Therefore, The Assessment of Community Awareness on Ecology, Conservation, and Distribution of White Winged flufftail (*Sarothrura ayresi*) of the country in general and of the study area in particular is required as a matter of urgency in order to understand the spatial and temporal patterns in their diversity and composition to take appropriate conservation management actions (Drummod,2013).

The Critically Endangered White-winged Flufftail (*Sarothrura ayresi*) is highly vulnerable to habitat loss and degradation in its sole known breeding ground, the Barga wetland. This decline is likely driven by human activities like overgrazing, deforestation, and agricultural expansion. Assessing local community awareness of the Flufftail's ecology, conservation needs, and distribution is crucial for designing effective, participatory conservation strategies. Existing information on the Flufftail and community awareness in the Barga wetland is limited, highlighting the urgency of this study.

This proposed study is therefore intended to add to existing information on White Winged flufftail (*Sarothrura ayresi*) and to reveal the Community Awareness on Ecology, Conservation, and Distribution of White Winged flufftail (*Sarothrura ayresi*) in the study area

1.3 Significance of the study

The purpose of this study was mainly conducts population size, nest recorded and to to get information of community attitude towards White winged flufftail at Barga wetland.



This study used to identify factors that affect white winged flufftail habitat and population and will give solutions for the problems.

This study aims to:

1. Assess population size and nests at Barga wetland.
2. Identify human activities that negatively impact the Flufftail's habitat and population.
3. Develop solutions for these problems through community-based conservation initiatives.

This research will contribute valuable knowledge to the conservation of the critically endangered White-winged Flufftail and empower local communities to become active stewards of their wetland habitat.

1.4 Scope of the study

This study was limited some areas at Barga wetland, in Adea Barga district where this bird is found

1.5 Limitation of the study

The white winged flufftails are very small and secretive birds, so it will be very difficult to count.

1.6 Objectives of the study

1.6.1 General objective

The general objective of this thesis was to investigate the population size, nest location and attitude of community's towards white winged flufftails in Barga wetland.

1.6.2 Specific objectives

The specific objectives of this study were to

- ✓ Conduct population census for white winged flufftails in Barga wetland.
- ✓ Create awareness of community on protection and conservation of the white winged flufftail in the study area.
- ✓ Assess the nest location of white winged flufftail at Barga wetland.



CHAPTER TWO

2. REVIEW LITERATURE

2.1 The White Winged Fluff tail

The white winged flufftail (*Sarothrura-ayresi*) is classified under the family *Rallidae* and the Genus *Sarothrura*. The species is a small, secretive little known Rail endemic to Africa. The adult male has a chestnut head and both sexes have a black barred chestnut tail and white winged-patches on the secondary flight feathers. The best chance of seeing this species of bird is during the wet season in upland marshes in Eastern South Africa and central Ethiopia. It categorized as Endangered in the 2008 IUCN Red List. This is because it has a very small range, with breeding proven at only three locations, the range is believed to be undergoing a continuing decline in extent, area and habitat quality, due to the rate of loss and degradation of the bird preferred habitat, seasonal marshlands (Bird Life International, 2008).

Ecological behaviors, the movement of this species are not fully understood. Lack of sub-speciation has interpreted to imply that the bird migrate between two range, and this is supported by the fact that breeding has not been observed in South Africa where it is considered by many to be a none breeding summer visitor (Urban et al., 2005). However, the fact that there are overlaps in occurrence has prompted suggestions that strict migration is unlikely (Taylor, and Van perlo 1998). One suggestion is that long distance dispersal occurs when numbers are high (Van perlo 1998), with local movements being predominant at other times.

In 2012 a survey was carried out in South- west Ethiopia during the none breeding season to understand more about the possible movement of bird between Ethiopia and South Africa, however, nor birds where found (Drerup, 2015). In Ethiopia, birds that breed in central highlands in June-September may move to lower level habitats during the breeding season, where highland areas become unsuitable. In South Africa the species is thought to be nomadic. Moving in search of its transient habitat, it is considered nomadic in Zimbabwe (Taylor et al., 2004).



Birds was stayed in Ethiopia between June and October, while the none breeding birds in South Africa from November to March, with a few records in May, August and September. Breeding occurs in July- August (Taylor et al., 2004). Breeding birds occurs at in density of 2-4 pair per hectar (Taylor and Van perlo, 1998). None breeding birds occur in loose associations.

2.2. Classification of white winged flufftail

The white winged flufftails classified under the class avian, order *Gruiforcarmes*, family; *Rallidae*, Genus, *Sarothruara ayresi*, sometimes without other chestnut flufftail species. Ethiopian birds first described as *Ortygops-macmillan* from a species pair with *S. watersi* Monotypic Synonyms; *Coturnicops ayresi*; *Ortygops-macmillani*. An alternative name is white winged crane. The taxonomic sources are Dowsett and Forbes.

2.3. Estimated Population of white winged flufftails

The population in South Africa is estimated to be 235 birds (Taylor and van perlo 1998), with at least a further 210-215 pairs in Ethiopia, that is probably 700 mature individuals in total (wetland international, 2006; Bird Life Internation,2008). The species population is suspected to be decreasing in line with levels of disturbances, loss and degradation in Ethiopia and South Africa (De Smidt and Enans 2003; Taylor and Grundling 2003, Drummond in litt, 2005). However, the likely rate of decline has not been estimated. Whether a single population migrates Ethiopia and South Africa or each country its own subpopulation is not yet known (Barnes, 2000, Taylor and Van perlo 1998), although the observation from a breeding site in Ethiopia discovered in 2005 show that the birds continue to breed into a dry season and may remain in Ethiopia after breeding winter than migrate (Bird Life international, 2005). Despite the great distance separating this bird tow centers of occurrence and the lack of records from most the intervening regions there appears to be no significant morphological differences between South Africa and Ethiopia populations, migration between the widely separated distributions in Eastern and Southern Africa is considered unlikely (Taylor and van Perlo, 1998).

2.4. Geographical Distribution of white winged flufftails

The white winged flufftail occurs in Ethiopia, Zimbabwe and South Africa and there is only one reliable record in Zimbabwe. Claimed records from Rwanda are unproven. The occupied breeding range has been estimated as 250km² (Anon, 1999). Currently in Ethiopia, the species has been recorded in three sites in central highlands (weserbi wetland, Barga Wetlands, and the Bilacha Wetland, all Wetlands are near Addis Ababa), the only breeding area for this specie (Taylor, 1998; Taylor and van perlo, 1998).in South Africa, the species is known from nine sites in the Kwa zulu, and M pumalaga (De Smidt, 2003). In Zimbabwe, according to Cizeket al (in prep), it was more regularly recorded from the Harare high rainfall wet seasons of the 1977 and 1979 than currently generally reported Bird Life (2008). It is known from three sightings from a marsh below the disused Western Sewage works, with another bird at the age of the Marimba marsh, Jan-March 1979 (Hopkinson and Masterson, 1977, 1984).

Table 1 White Winged flufftail distribution and population trend globally

Country	Population estimate	Distribution	Population trend
Ethiopia	50- 249 individuals (Bird Life International, 2020)	Oromia region	Decreasing (Bird Life International, 2020)
South Africa	50- 249 individuals (Bird Life International, 2020)	Middle punt wetland, Wakkerstroom, Steenkampsberg and Bedford wetland	Decreasing (Bird Life International, 2020)
Zimbabwe	50- 249 individuals (Bird Life International, 2020)	Harare (Monavale, Marlborough)	Decreasing (Bird Life International, 2020)
Zambia	50- 249 individuals (Bird Life International, 2020)	Chingola, Solwezi	Decreasing (Bird Life International, 2020)

(Source: EDGE fellowship.)

Table 2 White Winged flufftail local distribution

Country	Region / province	Site	Level of Protection	Population size	Reference(s)	Notes
Ethiopia	Oromia	Barga	IBA with no protection	50 – 249 individuals	(Bird Life International, 2020)	Birds still present at current time
Ethiopia	Oromia	Bilacha	No protection	Not known		The bird has not been recorded since 2018.
Ethiopia	Oromia	Weserbi	IBA with no protection	Not known		No recent records since late 1990s

(Source: EDGE fellowship).

2.5. Yearly Cycle of White Winged Flufftail

The apparent lack of sub-speciation has been thought to indicate that regular migration occurs between Ethiopia and South Africa of centers of distribution, but the paucity records from (1985), while birds may be present throughout the year at Barga Wetland, a recently discovered marsh near Addis Ababa (Taylor,1997). Much habitat in the central Ethiopia highlands, where most occurrences are recorded from June-September is a seasonal marsh and thus unsustainable in the non-breeding seasonal when migration occur SW to lower- latitude permanent marshes such as at Charada, Kaffa (Jimma area), where there is a May specimen (Taylor, 1994, 1996). (Assefa, 2015) suggested that males arrive in breeding areas before females. The best chances to see the birds are at flight than at rest

2.6. Reproductive Biology of white winged flufftails

Due to the limited knowledge on the species ecology and population dynamics, non-of the available literature describes its and reproduction. Excluding the down-covered chicks, three age classes have been recognized in white-winged flufflail: juvenile, immature and adult (Taylor, 2005 d). The timing of the moults between these different age classes does not appear to be known in the white- winged flufftail. In other



Sarothrura species partial post-juvenile (first pre-basic) moult (excluding remiges and rectrices) to assume immature plumage occurs between 3-10 weeks in Buff-spotted flufftail. *elegans*, 5/6 to 10/11 weeks in Red-chested flufftails *rufa* and from 5 weeks in Streaky-breasted flufftail *boehmi* (Taylor, 2005 a). Very little appears to be known about the timing of first pre-breeding (prealternate) moult to assume adult plumage, but in streaky-breasted flufftail it occurs six to seven months after the completion of the post-juvenile moult (Taylor, 2005 b), therefore 8-10 months after hatching; full adult plumage being attained at about 11-12 months old. The post-breeding moult in adult flufftails is complete with erratic, synchronous or descendant moult of the primaries (Taylor, 2005 c). Juvenile white-winged flufftails are identified by their “predominantly grey-brown” or “blackish brown” heads with no rufous or chestnut wash to the breast (Taylor 2005 d). Immature are intermediate with some development of chestnut or rufous on the head and breast (Taylor 2005 d). Unlike most *Sarothrura species*, sexual dimorphism in adult white-winged flufftails is not pronounced, with both sexes having chestnut (Bird Life international, 2004).

2.7. Life History: Breeding

Season of the nest building and egg laying occur in Ethiopia during long rains in July-August. A juvenile recorded in South Africa in November is probably from an egg laid in August. Despite claims to the contrary there is as yet, no acceptable evidence that the species breeds in South Africa (Taylor 1994). Nest building recorded was found in Ethiopia in 1999 and was situated in short grass (300-450mm tall), in damp ground in an upland wetland that was drying out. The nest was built in a tuft of *Eliocharis*, Sedge with its base 10mm above the ground. It was around ball with a side entrance and was made with stems of grass and sedge, with the live plant stems drawn over the top to form the roof. Further nest descriptions were made by Allan *et al.* (2006).

Regarding to eggs, a clutch of five pure white eggs from the nest found by Tarboton (2001) measured 27 times 20mm. the clutch found by Allan *et al.* (2006) had four unmarked ivory white eggs.



Regarding to chicks, both sexes apparently feed and care for chicks. Adults leave observers away in dense cover (Gumbo, 2005). Observation in Ethiopia suggests that birds commence nesting immediately after as a little as six weeks, after all birds may leave breeding habitat, which may have become unsustainable as the result of damage from grazing, trampling and cutting. Some birds may be able to raise a second brood elsewhere, before the end of October, in the late developing habitat. Natural predation of eggs and young's may be low at Ethiopia breeding sites (Drent, 2006). Studies in Ethiopia have provided the following information. Adults take earthworms, small freshwater and crustaceans, and the adults' larvae of aquatic and terrestrial insects such as Lepidoetra, Colepetra and Dipetra. Foraging has been observed from early to mid-morning and in the late afternoon (Taylor 1996, 1997b).

2.8. Habitat Requirements

Apart from records, no detailed observational data has been collected about the species ecology outside the breeding season. Most of the information on habitat is derived from (Taylor, 1994, 1996) Ethiopian habitat is seasonal, dense rapidly growing vegetation 20-50cm tall. Dominant plants include sedges, grasses and forbs such as *Uebelina kigesiensis*, *Trifolium-calancephalam*, *Ranunculus*, *Rumex maginulata*. in the breeding habitat, birds forage along muddy cattle tracks, at shallow pools, and at patches of cut vegetation and other small open areas in the dense cover, taking insects and other invertebrates from moist ground, mud and shallow water, and from flattened low-growing vegetation, both adults and chicks apparently also forage in more deeply flooded vegetation (Taylor 1994, 1996).

In South Africa nine of ten important confirmed sites for the species are within the Eastern uplands, Great Escarpments, Mountains and Highveld pet land Eco regions, emphasizing the importance of peat- based habitats (Taylor and Grudling, 2003). Non breeding birds in South Africa occur for short periods alongside breeding Red –chested flufftails in the dense hygrophilous grasses. In Zimbabwe birds were recorded from grasses 50-100cm on dry to moist ground also from muddy to shallowly flooded marshy ground with grass and cover (Hopkinson and Masterson, 1984), and in Zambia, one bird



was found in a pan –like marsh with emergent grass (Brooke 1964). It is recorded at 1,300-1,400m in Zambia and Zimbabwe; in South Africa it occurs at mostly at 1,100-1,900m and has been recorded rarely at 150m in areas (Tzortzakaki, 2017). White winged flufftail is one of the two species listed on Annex 2 of AEWA that are judged to be critically threatened by climatic change.

2.9. Conservation status

Since the realization that Ethiopia is an important site for the species, the Ethiopian Wildlife and Natural History Society (EWNHS) along with the Middle punt Wetland Trust and Birdlife South Africa have initiated several research and conservation works at the Barga site. This has resulted in the advancement of knowledge about the species, community development work in the area including the digging of new water wells, construction of a school, and the establishment of a strong Site Support Group (SSG) at Barga. An SSG is a local conservation group that is usually set up by Bird Life International partners in order to conserve a threatened bird species and its habitat. In this particular instance, the SSG undertake several conservation activities such as protecting the core habitat of the species by making sure that grasses in these core habitat areas are not harvested during the birds breeding season. The SSG also helps to raise awareness about the species in the local community (Ash, 2009).

Two of the sites (Barga and Weserbi) in Ethiopia are Important Bird Areas but do not have legal protection. At Barga, some 400 hectares of land is owned by the Holeta Agricultural Research Centre, which is used for breeding cattle. The organization does not allow grazing on this land from June until December, which synchronizes with the time the species inhabits Ethiopia. The rest of the grasslands are unregulated communal and private grazing areas.

Weserbi has become quite degraded over recent years and is therefore not suitable for the species. Unless grazing pressure is significantly reduced, this site will no longer be able to support the species into the future.

Bilacha is a relatively small area and it is mostly communal grazing land with some fenced off private grazing areas. Some individuals who own small pieces of the wetland



have erected fences to prevent other cattle from grazing on private property (land) and not necessarily to protect the bird's habitat.

Table 3 White Winged flufftail habitats (grass types)

	Local name (Oromiffa)	Scientific name
1.	Ashufe	<i>Eragrostis tenuifolia</i>
2.	Balemi	<i>Andropogon dummeri</i>
3.	Chefe Guba	<i>Ranunculus multifidus</i>
4.	Kuni	<i>Cyperus rigidifolius</i>
5.	Chilimo	<i>Cyperus atronervatus</i>
6.	Buski	<i>Cyperus dichrostachyus</i>
7.	Amakyta	<i>Trifolium wartinianum</i>
8.	Welebo	<i>Crinium abyssinicus</i>

(Source of data: EDGE fellowship)



CHAPTER THREE

3. MATERIALS AND METHODS

3.1. Description of the Study Area

The study was conducted at Barga Site, Adea Barga district which is found in west Showa Zone. The Zone has 24 districts. Among the 24 districts, Adea Barga District is purposefully selected for this study. The district has thirty six local kebeles. The center of the District is Enchini, which is located at 64km west of Addis-Ababa. From former reports by Taylor (1994), of the thirty six kebeles in the district, only four kebeles have the documents and information on the distribution of white- winged flufftail (*Sarothrura ayresi*) birds. The four kebeles are also located around Barga Wetland, which is the main breeding site of the bird.

Adea Barga is surrounded by Mulo Woreda from East, West Metta Robi, North Kuyyu, Degam, South Welmara and Ejere. The woreda is 798.35 Area in kilometer-square. Adea Barga district has altitudes range from 1166-3236 meters above sea level, rain fall that ranges from 887-1107mm and temperature ranges from 11-21 degree Celsius.

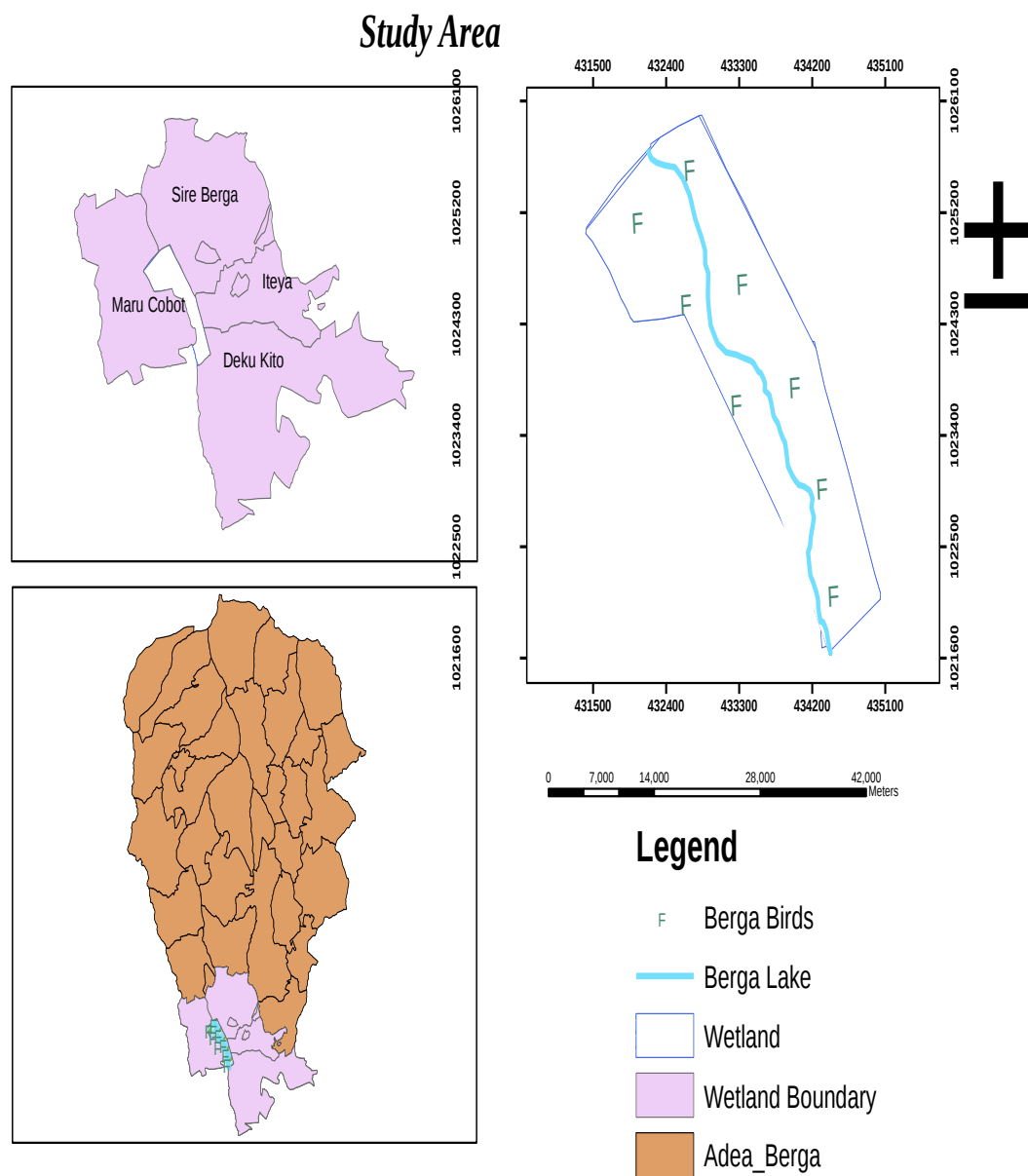


Figure 1 the map of Adea Barga within study area



3.2. Study Design

The design of the study was a community based cross sectional survey by using both qualitative and quantitative method to investigate community awareness about ecology, conservation and distribution of white – winged flufftail at Barga Wetland. The four study kebeles (Sire Barga, Maru chobot, Iteya, and Kitto) are selected as they encompass wetland areas that serve as habitat for this bird species.

Data were collected both by primary and secondary. Primary data were collected from purposively selected households through self-administered questionnaire and focus group discussions. In depth interview were carried out with selected respondents. Primary data were also obtained from extensive survey of the study areas for population census of WWFs. On the other hand, the secondary data were collected from already available sources such as books, internet, scientific journals, etc. through document analysis.

For this study, I have used purposive proportional random scheduling system because the number of households was varying in study areas. The questionnaires with two sections were developed based on the questionnaire model on several other questionnaires that have been conducted in assessing community awareness and knowledge on the distribution of other birds in the study areas (Shimelis, A et al., 2003).

The first section represents socio demographic factors of respondents (age, sex, educational level, religion, occupation) in which the variables were coded. The second section focused on general questions on the community awareness about ecology, conservation and distribution of white winged flufftail.

3.3. Data Collection Procedures

Population census of white winged flufftails, questionnaires and focus group discussions were used as means data collection procedures.

The questionnaires were prepared in English and were translated in to Afan Oromo during interviewing by data collector.

3.3.1. Sampling Technique and Sample Size

To determine the sample size, the formula following Cochran (1963) was used. A total of 572 (400 males and 172 females) household owners were selected currently those living in the four kebeles around watershed areas of Barga wetland. Accordingly, the formula as per Cochran (1963) to determine the sample size was indicate

$$n_0 = \frac{PQZ^2}{e^2}, \quad z = 1.96, p = 0.5, q = 0.5, e = 0.05$$

$$n_0 = \frac{(1.96)^2(0.5)(0.5)}{(0.05)^2} = 385$$

Where, n = the sample size

Z^2 = the abscissa of normal curve that cuts off an area sigma

e^2 = the desired level of precision

p = estimated proportion of an attribute present in the population

$N = 572$ total number of populations, $n = 230$ sample size

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}, \quad = 1 + \frac{385}{572}$$

$$n = 1 + \frac{385}{572}, \quad = \frac{385}{1 + (0.67132)}$$

$$n = \frac{385}{1.67132} = 230 \text{ sample size}$$

The four kebeles were selected out of thirty six kebeles purposively and sample was taken using proportional probability sampling system. The reason why was that, the white winged flufftails were found primarily in Ethiopia in three places: Barga wetlands, Sululta and Weserbi areas. Since the study area was in Barga wetland, the surrounding kebeles were used to get information from the local populations. Moreover, there were variations in the number of household- heads in each kebele. For the kebeles with large populations, large numbers of respondents were taken and vice- versa. For this task, the random scheduling system was preferred purposively; to obtain the required sample size of 230 respondents out of 572 household heads from the four kebeles, grouping of the



selected sample size (n) was carried out. By using the above scheduling system from the total 46 household heads, 18 household- heads were selected in Sire Barga kebele, 79 respondents out of 196 household- heads in kitto kebele, 105 respondents out of 260 household heads in Maru Chobot kebele, 28 respondents out of 70 household heads in Etaya kebele was selected purposively, Generally, the total sample size selected as respondents equals 230 by using Cochran formula from the total populations of 572 household heads. (Source of data: Agricultural Bureau of the woreda).

3.3.2. Methods and Instruments of Data Collection

Among the types of research approaches, for this study a mixture of quantitative and qualitative approaches were employed.

3.3.2.1. Questionnaires and Focus Group Discussion

The survey was conducted between February 2023 and October 2023 when the birds are available in the study area. In Barga, a total of 55 sites were randomly selected. The birds stay at Barga- Wetland from the end of May to October. Focus-group discussions were conducted in the survey area to obtain valuable information for drafting of the questionnaires and were done by using 230 respondents or individuals, and then be revised as necessary.

A questionnaire for individual households was focus on issues related to the community attitudes towards white winged flufftails at study area. The options for questionnaires was grouping in the following: first section on demography and farming practices, second section was begin with the general question on main issue they were asked about the bird species in the area; when, where and how often they see the birds and the like, the third section about their beliefs in association with the birds. The next questions each descriptor from which the individual would choose the one that best describe his or her belief were used. Information from field visits or surveys from each kebele had also been compiled. The data gathering tools were video camera, tape-recorder, notebook, pen, and direction indicator- GPS, umbrella for protection of rain and overhead sun as instruments of data collections were used.

The data collector has conducted focus group discussions in four kebeles. It was conducted with small group of inhabitants from each kebele. The discussion was held to explore their knowledge about white winged flufftails. Open ended questions were prepared by researcher in order to cover the topics of the study on white winged flufftails as well as to allow discussants to discuss the issues more freely than they could with closed or forced choice questions of structured questionnaire (Hall and Hall, 1996).

Table 4 Respondents of focus group discussion

No	Kebeles	Male	Female	Total
1	Eteya	7	-	7
2	Kitto	3	4	7
3	Maruchebot	8	8	16
4	SireBarga	4	3	7
Total		22	15	37

3.4. Population size

Population size and seasonal distribution of White Winged flufftail were studied during the May to October. The number of White Winged flufftail in the morning and in the afternoon was counted for four days per month. Total counts in all sites were made on the same dates (unified count date). When it was impossible to complete a count in the morning due to bad weather condition, White Winged flufftail were counted as they returned to the same roosting area in the evening the same day, based on the hypothesis that White Winged flufftail generally return to the same location on successive nights to roosting areas (Wang,2014).

Study areas were systematically surveyed on foot monthly and seasonally. All individual White Winged flufftail observed were counted. To avoid repeated counting of birds, areas were divided based on their distribution and habitat types. For larger number of birds (>4,000 birds), poor visibility, or both, White Winged flufftail were counted in groups as suggested by (Tilahun, 1996). This was achieved by counting birds in estimated groups of 10, 100 or 1,000 (depending on flock size) (Shimelis, A et al., 2003).



White Winged flufftail were counted individually, when they were in small flocks, and in units of 10 or 100 in large flocks. Each count was done with the help of at least two field assistants, and the mean was used as the abundance.

In Barga, a total of 55 sites were randomly selected. The selected sites were at least 120 m apart from each other, which we considered to be a good estimate to be sure that the individual White-winged Flufftail we encounter at one site will not have travelled to the other site. Each site has 3 transects which are 100m long. We placed three waypoints on each transect, two at the end points and one in the middle. Thus there were 9 waypoints on each site and a total of 495 waypoints across the 55 sites. These waypoints were used as White-winged Flufftail sampling points.

To minimize disturbance during counting, movements were silent followed by 3-5 minutes of waiting period to allow them settle down (Dowsett, 1993). Census data were collected twice a day early in the morning (06:30-10:00 h) and in the afternoon (14:00 - 18:00 h) from all census routes, when most of the avian species were most active (Shimelis, A et al., 2003). Individuals of adults and chicks were recorded to determine the proportion. The edges of sub-areas were determined beforehand. In order to avoid double counts moved to the next point as rapidly as possible without disturbing birds.

preliminary survey for nest searching was done at different sites in the Barga wetland and surrounding farmland habitats considered to be potential breeding sites based on the presence of grasses, trees and extensive water body, including the availability of food source, which were basic requirements for nesting of this birds (Wang,2014). The search involved direct observations from vantage points and from the ground using a telescope and binoculars. Information provided by local people, seasonal and permanent settlers in the Adea Barga and surrounding farmlands was used as a primary source of information. Moreover people looking after cattle were used as primary source of data in the area.

When nests were observed, the nest location was recorded with GPS. At the same time, nest platforms were classified and recorded as active (when breeding pairs were observed with eggs or while incubating, hatched or inactive (when breeding pair was observed without egg, but with a nest) (White,2005).Whenever nests with cold, uncovered and complete eggs with no White Winged flufftail present were found, such nests were



recorded as abandoned. Such nests were repeatedly checked to confirm the nest status (Shimelis, A et al., 2003).

Nests constructed in different sites were measured since the initiation of nesting in May. Nest dimension such as the nest length, width, height from the ground up to the end of nest edge or rim were recorded. A total of 8 nests were measured using measuring tap to determine the nest morphometry. In addition, nesting materials and their surrounding vegetation were carefully noted. Plants used as the nesting materials were collected and identified using the Flora of Ethiopia (White, 2005).

When active nests were located, clutch size was recorded. For those pairs located before egg laying, their egg laying dates were recorded accurately through intensive follow-up. The dimensions of egg length, width (maximum diameter) and egg weight were measured (Werema, 2015).

Active nests were monitored by visiting four to six times during the incubation and post hatching period (may-October) to determine reproductive outcome (hatching success and fledging success). Hatching or nesting success was determined by examining the fate of eggs laid at the end of the incubation period or early hatching time and those nests which were considered successful were those which have hatched ≥ 1 eggs (White,2005). Young birds reaching the height of their parents and starting to fly were considered as fledged individuals.

Nest or clutch initiation was defined as the date the first egg was laid in a nest. This was determined through a series of weekly checks (White,2005).For those nests which were found with incubating pairs, dates of nest and clutch initiation were extrapolated deducting from the dates of hatching to determine the peak breeding season (White,2005).

Presence of predators (a mammal or birds of prey) either during incubation or during the post-hatching period was recorded through repeated observations during the study period. Predators were considered if they showed frequent presence in the nests site (Shimelis, A et al., 2003). Birds of prey or other animals, which try to take chicks from the parent during post-hatching period, were recorded as predators (White,2005).During the survey



period, careful observation was followed to reduce disturbances to the breeding pairs in their breeding habitat are highly sensitive to disturbances, and they abandon their nest during the nesting period (Werema, 2006).

3.5. Diurnal activity patterns

Behavioural observations were made during dry and wet seasons. Dry season observations were in May and October and the wet season observations were from June to September in the Barga wetland habitats. Observations were made using a pair of binoculars from early in the morning to late in the afternoon (06:00-18:00 h).

Once flocks or pairs of individuals of White Winged flufftail were located, instantaneous scan sampling was carried out (Keith, S. 1986) to collect the daily activity time budget of the species. This was separately recorded for both dry and wet seasons. Instantaneous scan sampling provides an overall estimate of proportions of an individual engagement in different behaviours (Dowsett, 1993). This involved scanning each individual in turn and categorizing its major activities (e.g. feeding, resting, locomotion, alerting and others behaviours).

Individuals were scanned or observed for five minutes, during which instantaneous behavioural observations were recorded at 15minute intervals (Guichard, 1948). Total number of birds present in each flock and the habitat were recorded. Observations were restricted to adult birds only as there were only very few in the Barga wetland habitat to collect data (Wang, 2014). Most diurnal behaviour observations were performed from a vantage point outside the wetland edge to avoid disturbance to birds. The observer waited approximately five minutes after the arrival at an observation point to begin behavioral observations, thus minimizing potential observer influence on bird behavior (Werema, 2015). The following seven major behavioural activities of the White Winged flufftail were distinguished: foraging, resting, comfort movement, locomotion, vigilance, social behaviour and other behavior.

Foraging behavior refers to a White Winged flufftail actively searching for food while walking with lowered head or head down, picking food items and ingesting. Resting behaviour refers to a White Winged flufftail pausing, sleeping or loafing. Locomotion includes flying, walking while raising the head, running, flight and flapping. Comfort



movements refer to cleaning or preening as well as muscle stretching. Vigilance or alert behavior refers to scanning or observing the surrounding area by raising its head upward or neck extended (Shimelis, A et al., 2003). Social behaviour refers to behaviours of aggression such as chasing, pecking or biting and courtship such as sexual or mating behavior. Vocalizing and drinking were grouped as other behaviour (Tilahun, S 1996). While recording behavioural activities, whenever more than one behavioral state occurred at the same time, the more frequent one was taken (Dowsett, 1993).

In order to determine the influence of the time of the day on behavioural activities, days were divided into three four-hour time blocks from sunrise to sunset: morning (06:00-10:00 h), mid- day (10:00-14:00 h) and afternoon (14:00-18:00 h), following (Tilahun, S 1996). Likewise, to see variation on the preference of White Winged flufftail across the different habitats and their activity period, the type of habitat for each flock located was recorded. Furthermore, observations were reasonably well-balanced across time periods, among habitats and between seasons, to see variation and relationship of activities to varying variables (Allan, 2006).

3.6. Foraging behaviour

Data on the food and foraging behaviour was recorded during the dry and wet seasons in Barga wetland. To investigate and study what type of food items White Winged flufftail forage on, groups or individuals randomly observed in the foraging habitat were followed and carefully observed. Information on the food items consumed was obtained by direct observation in different habitat types where the birds forage (Del Hoyo, 2010). Unidentified food items such as grains, roots, stems, worms, insects and plant parts encountered were collected for identification. Feeding techniques or type of foraging adopted by White Winged fluff tail to obtain different parts of a plant and animal were recorded as graze and pick foraging, following the classification by (Del Hoyo, 2010).

All observations on diet studies were carried out between the hours of 06:30-11:30 h and 14:30-18:00 h. especially when the environment in quiet during slight rain. These time periods were selected as found to be active foraging times of the species (Wang, 2014).



Data collection was made once per week. Identification of plant items foraged was done using the flora of Ethiopia (Tilahun, 1996).

3.7. Attitude of local people towards White Winged fluff tail

To study and understand the levels of interactions between local farmers, cattle herder and White Winged fluff tail in Barga wetland, communities surrounding the wetland were contacted and interviewed. First, an introductory description about the study was made to the randomly selected respondents to familiarize with the aims of the study to invite their participation. Local farmers were clearly informed that the data would be available, and assured of confidentiality.

A total of 60 farmers and cattle renders were randomly selected from the study area. Then, semi structured and face to face interviews were conducted to collect data, which have the power to elicit land holders' attitudes and perceptions accurately than posted questionnaires, telephone, or electronic surveys (Werema, 2015). To compare and determine the differences between farmer's perception and attitude towards White Winged flufftail and their damage, their level of understanding with the species and the wetland and its conservation in general, equal number of farmers was selected from different Kebeles surrounding the wetland habitat. Houses were selected and marked randomly. Then household heads were selected from the selected houses. If household heads were not present, the next one in the family was selected for the interview.

The strategy used in this study was, semi-structured interview combined questions of more quantitative, close-ended with less qualitatively oriented, open-ended questions aiming at collecting both accurate and attitudinal data (White, 2005). The close-ended questions provided a greater uniformity of responses, which were more amenable for quantitative analysis, whereas the open-ended questions allowed access to certain issues in more depth (White, 2005).

3.8. Views of farmers on Barga wetland and its conservation

Farmers were asked potential benefits they get from the wetland and their knowledge and understanding on the value of the wetland to their livelihood. This is a variable where willingness of farmers to conserve the wetland in the future is inquired. Current uses



were grouped and arranged by presenting a list of possible Barga wetland uses such as for grazing and drinking by cattle, cutting grass for construction of traditional houses, sale in the market and as cattle feed.

Local people were asked to mention the major threats affecting the wetland which will help to create awareness for the local people and having such information is important for the success of conservation activities (Wang, 2014). Farmers were also asked their knowledge and level of understanding on any type of sustainable natural resource or biodiversity conservation such as flora and fauna and utilization.

3.9. Methods of data analysis

The analysis and interpretation of the data collected had been made by using appropriate computer software. The collected data from household surveys was entered in to computer analyzed using SPSS version20 software. The SPSS data analysis was mainly based on descriptive statistical tools frequency distribution, percentage and others. For interviews and field observation, qualitative analysis was used. Data collected were organized in an excel sheet and origin for statistical analyses.



CHAPTER FOUR

4. RESULT AND DISCUSSIONS

4.1. Socio demographic Characteristics of the households

The socio demographic characteristics of the respondents in self-administered questionnaires were summarized and presented. Out of 230 respondents, 201 (87.4%) of them were males and 29 (12.6%) were females. Age of respondents, 190 (82.6%) of respondents were 31-64 years, 17(7.4%) of respondents were 15-30 years and 23(10%) of respondents were more than 64. With regard to education 115 (50%) cannot read and write, 72 (31.3%) were first cycle primary school, 28 (12.2%) second cycle primary school, 8 (2.6%) were high school level, 5 (2.2%) were high school completed, and 2 (0.9%) were diploma level trained.

Regarding their major occupation, 226 (98.3%) were farmers, 4(1.7%) were merchants. Similarly, with regard to religions, 155 (67.4%) were Orthodox, 65 (28.3%) were Protestants, and 10 (4.3%) of them were Wakefata followers.

Table 5 Socio demographic characteristics of respondents in self-administered questionnaires

Characteristics	Frequency	
Sex	N	%
Male	201	87.4
Female	29	12.6
Age		
15-30	17	7.4
31-64	190	82.6
> 64	23	10

Education level

Non formal educational	115	50
First cycle (1-4)	72	31.3
Second cycle (5-8)	28	12.2

9-12 grade	8	2.6
Grade 12 completed	5	2.2
Diploma	2	0.9
Occupation		
Farmers	226	98.3
Merchants	4	1.7
Religion		
Orthodox	155	67.4
Protestants	65	28.3
Wakefata	10	4.3
Muslims	-	-

4.2. Knowledge of participants on the ecology of white winged flufftails in Barga wetland

4.2.1. Awareness of respondents on the availability of white winged flufftails in Barga wetland

As shown in below graph, out of the total respondents (males and females) (15.2%) of them were responded the white winged flufftails seen throughout a year in Barga wetland, (20.8%) of respondents tolled the presence of white winged flufftails twice a year and (63.9%) indicated the presence of the birds in the study area and stayed in Barga wetland from the end of June to the end of October. In connection to this former studies have indicated that for white winged flufftails the egg laying and nest building take place in Ethiopia during long rains (Taylor 1994, cited in De Smidt et.,al 2008).

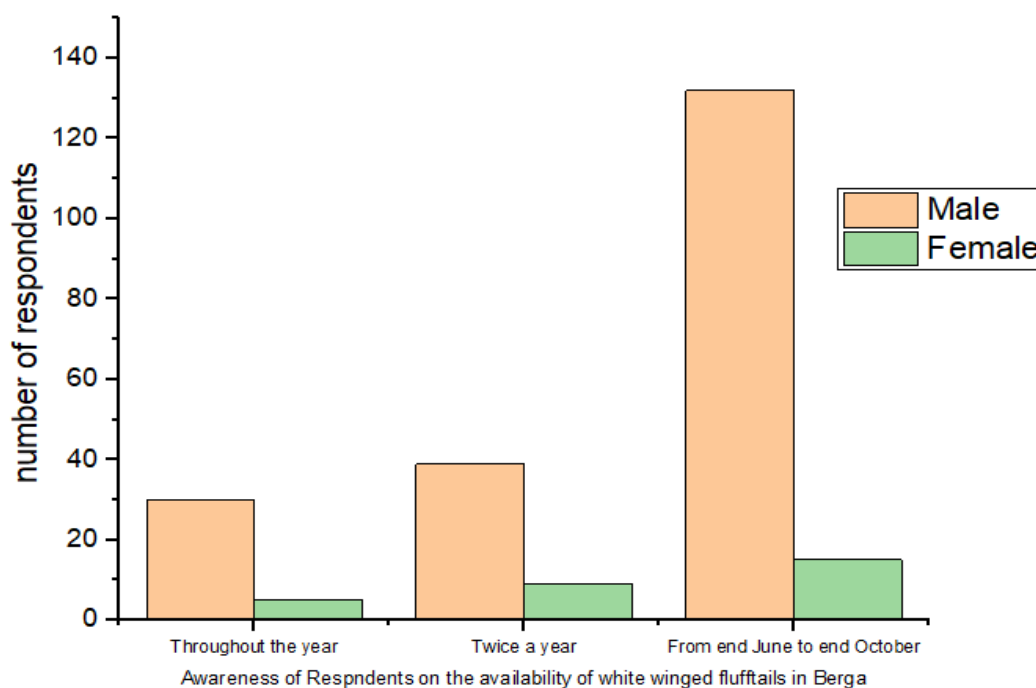


Figure 2 Awareness of respondents on the availability of white winged fluff tails

From the results indicated in table 6, (69.6%) of the respondents have replied that Barga, Weserbi, Bilacha, and Sululta wetlands are the place where white winged flufftails are distributed in Ethiopia. Out of 230, (30.4%) of respondents have no awareness about places where white winged flufftails distributed in Ethiopia other than Barga wetland. In connection to this, the species of white winged flufftails has been documented in central Ethiopia highlands before intensive human pressure (Taylor, 1997a).

Table 6 Knowledge about a place where white winged fluff tails presents in Ethiopia

Variables	Participants				Total	
Do you know places that the white winged flufftails found in Ethiopia?	Response					
	YES		No		N	%
	N	%	N	%	230	100
	160	69.6	70	30.4		



4.2.2. Feeding items of white winged flufftails

The type of food consumed by the birds has been recognized by respondents. Based on the information obtained in Table 7, (63.5%) of the respondents were responded that insects, grasses, and other wetland creatures were food that consumed by white winged flufftails. Similar studies on migratory Stopover of Songbirds in the Western lake Erie Basin showed that wetlands in the study area support high concentrations of emergent aquatic midges (Del Hoyo, 2010), which were considered an important food resources to migrating birds in the Great Lakes region, particularly in spring (Werema, 2015). On the other hand, (36.5%) of the respondents did not know about feeding items of white winged flufftails in Barga wetland.

Table 7, Respondent's idea on feeding items of white winged flufftails

Variables	Responses				Total	
Do you have information's on feeding items of white winged flufftails?	Yes		No		Sample=n	%
	N	%	N	%		
	146	63.5	84	36.5	230	100

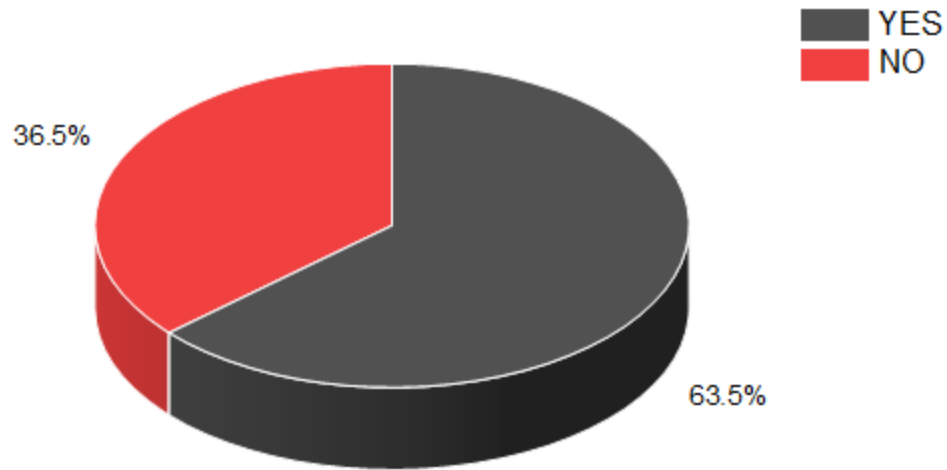


Figure 3 Respondent's idea on feeding items of white winged fluff tails

4.2.3. Ecological interaction of white winged flufftails in Barga wetland

From the total respondents involved, (57.9%) respondents have replied yes or have an awareness that they have noticed that these white winged flufftails had ecological interactions with their environments, other birds and living things in the Barga wetland. This result was in agreement with the report of (Keith, S. 1986) on similar wetlands where fundamental portions of various living organisms interacting into structures and welfare of societies and natural ecosystems. Out of 230 respondents, (41.8%) individuals have replied no which means respondents had no awareness on the ecological interactions of the birds in the study areas.

Table 8 Ecological interactions of White winged flufftail in Barga wetland

Variables	Response of respondents					
Do you have any awareness about the interactions of these birds with other living organisms?	Sex	Yes	%	No	%	
	Males	121	52.2	80	34.8	
	Females	13	5.7	16	7	
	Total	134	57.9	96	41.8	
Educational level	Yes	%	No	%	Sample	%
Non formal	50	21.4	65	28.3	115	50
1-4 grades	45	19.6	27	11.7	72	31.3
5-8 grades	20	8.7	8	3.5	28	12.2
High school	8	3.5	-	-	8	3.5
Certificate	5	2.2	-	-	5	2.2
Diploma	2	0.9	-	-	2	0.9
Total	130	56.3	100	43.5	230	100

4.2.4. Knowledge on factors influencing the distribution of white winged flufftails

From the result obtained in Table 9 out of 230 respondents (70.8%) were reflected overgrazing by cattle, cutting grasses, agricultural expansions, weather conditions, predators were the common factors that could have influenced white winged flufftails in Barga wetland. The result of the investigation is also corresponds to the report presented by (Tilahun, 1996), the degradation of birds' habitat due to the presence of cattle in the wetlands and surrounding grasslands, impact of cutting sedges by (Guichard, 1948). On the other hand, (29.2%) of the respondents did not know what factors affect the distribution in the wetland.

Table 9 Knowledge of respondents on factors influencing distribution of white winged flufftails

Variables	Respondents					Total %
Do you know any factors that influence the distribution of white winged flufftails in Barga wetland?	Sex	Yes	%	No	%	
	Males	145	63	56	24.3	87.3
	Females	18	7.8	11	4.9	12.7
	Total	163	70.8	67	29.2	100
Educational level	Yes	%	No	%	N	
Non formal	73	31.7	42	18.3	115	50
First cycles (1-4)	53	23	19	8.3	72	31.3
Second cycle (5-8)	22	9.6	6	2.6	28	12.2
High school	8	3.5	-	-	8	3.5
Certificate	5	2.2	-	-	5	2.2
Diploma	2	0.9	-	-	2	0.9
Total	163	70.8	67	29.2	230	100

Table 10 Natural phenomenon influencing white winged flufftails conservation in Barga wetland

Variables	Response of respondents						Total
Are there any natural phenomenon's that have influenced the presence of white winged flufftails in the study area?	Sex	Yes	%	No	%	N	%
	Males	90	39.1	111	48.3	201	87
	Females	10	4.3	19	8.3	29	13
	Total	100	43.4	130	56.6	230	100

From the result obtained in above Table, out of 230 respondents (43.4%) have reflected the presence of natural phenomenon that affected white winged flufftails at Barga wetland. They mentioned climate change affected white winged flufftails conservation.



This result is in agreement with the investigations of John Faaorg and Richard Holmes on the impact of climate change on avian life (Cotton, 2003, Both, cited in: Jhon *et al.*, 2010). On the other hand, (56.6%) respondents did not have any awareness on natural phenomenon that influenced white winged flufftails in Barga wetland.

Table 6 Knowledge of respondents on Factors that affecting white winged flufftails more in Barga wetland

Factors	Respondent number	Respondent in %
Socio-cultural effects and cultural attitudes	56	24.3
Grazing pressure	44	19.1
Expansion of agriculture	32	13.9
Climate change	28	12.17
Economic implications	27	11.74
Existing conservation Measures	22	9.56
Administrative/political set-up	21	9.13

From the result obtained in Table 11, (24.3%) of respondents have replied socio-cultural effects and cultural attitudes affecting the white winged flufftail, (19.1%) of respondents addressed grazing pressure was more influenced the white winged flufftail, (13.9%) expansion of agriculture, (12.17%) climate change, (11.7%) economic implications, (9.56%) existing conservation measures and (9.13%) of respondents were replied that white winged flufftail was affected more by above factors.

4.3. Socio-cultural effects and cultural attitudes

Local communities are accustomed to cutting grass from the area during the breeding season for coffee ceremonies. During the ceremony, coffee is brewed in a clay pot on top of a small furnace and the cut grass is placed over the floor especially near the furnace.



This ceremony takes place in most days of the year and it disturbs the habitat of these species. This activity can negatively impact the species by increasing the chances of trampling and disturbance of the nesting sites. This could decrease its breeding success. The respondents stated that when the community feels their concerns and priorities are addressed and heard they can do a lot to support the conservation efforts in the area.

4.3.1. Economic implications

The community has in the recent past started planting eucalyptus trees as a means of income generation. Farming is also slowly rising in the area. This will affect the habitat structure and the water content of the area. Providing other means of diversified community income instead of planting eucalyptus trees.

Cutting grass like Ashufe (*Eragrostis tenuifolia*) is also used to generate income by selling as fodder for cattle. This is one of the suitable grasses used by the species to as nesting habitat. Thus overharvesting this species will decrease its nesting success. Maybe able to use some of the grass after the chicks have fledged. Grass like migra (*Pennisetum schimperi*) is used for making handicrafts like sewed containers. If not sustainably used this grass type may not be found in abundance and thus slightly affect the livelihoods of the community.

4.3.2. Existing conservation measures

The area that is owned by the cattle rearing state farm (400ha of the core area) helps to minimize grazing and trampling in the area. The SSG sometimes attempts to protect the breeding area at Barga which is less than 5km². The area does not cover all the suitable sites for the species at Barga. Furthermore, there are instances when some people would illegally cut grass and cattle would graze in the area. Some of the cattle of the state farm are allowed to graze to the west of the river and this could affect the species. The state farm conducts patrols from June to December to prohibit illegal grazing, which will be very beneficial for increasing the nesting success of the species.

4.3.3. Administrative/political set-up

The respondents stated that, Local administrative governments are aware of the importance of the Barga site for the survival of the species. They have other priorities and usually do not work towards its conservation. If they get to prioritize it they can make a huge difference in the conservation of the species.

4.4. Knowledge of Respondents on Population trends of White Winged Flufftails in Barga Wetland.

Regarding to population trends of the white winged flufftails, the result in Table 12 below shows that, the respondents had different opinions. Out of (30%) of the respondents mentioned that population of white winged flufftails had increased. (46.9%) of the respondents explained that the number bird has decreased, and (23.4%) of the participants said that population trends of the white winged flufftails remained unchanged. The result is in agreement with the report on perception differences of community on species richness, diversity, and abundance in the fragmented wetlands of Brazil (Keith, S. 1986).

Table 12 Population trend of white winged flufftails in Barga Wetland

Variables														
How do you perceive this bird population?	Non Formal	%	First Cyc	%	Sec. cyc	%	H. s.	%	Cert.	%	Dip	%	Total %	N
a) Increase	39	17	22	10	6	2.6	1	0.4	—	—			30	68
b) Decrease	46	20	30	13	18	7.8	7	3	5	2.2	2	0.9	46.9	108
c) No change	30	13	20	8.7	4	1.7			—		—	—	23.4	54
Total	115		72		28		8		5		2		100	230

Cyc. =cycle, sec. = second, H.s. = High school, Cert. = certificate, Dip=diploma

4.5. Knowledge on benefits of white winged flufftails for Barga wetland community

Knowledge on the importance of the white winged flufftails and Barga wetland from the reflection of respondents are summarized below in Table 13. From 230, (82.6%) male and (10%) female individuals mentioned that the white winged flufftails and the Barga wetland provided various benefits for the communities surrounding Barga wetland. The most important benefits were site of tourist attraction and place of agricultural ceremonies for the community. From income of tourism the community obtained cows, sheep for poor people who cutting sedges for selling, chances of getting clean drinking water for community and stock animals, and building school were the benefits of the community in the study area.

Table 13 Knowledge on the benefit of white winged Flufftails to community around the Barga land

Variables	Sex	Frequency			
		Yes	%	No	%
Do you think white winged flufftails is useful bird?	Male	190	82.6	11	4.8
	Female	23	10	6	2.6
	Total	213	92.6	17	7.4

4.5.1 Respondents perception to prevent factors affecting conservation of white winged flufftails in Barga wetland

From the table 14 below, out of 230 respondents, (65.2%) males and (9.1%) females explained that raising awareness through the community education, protecting cutting sedges, preventing agricultural expansions towards Barga Wetland and capacity building people living in Wetland water shed were strategies that enabled them to prevent factors influencing these birds conservation in Barga Wetland. (22.2%) males and (3.5%)

females didn't have information that prevents factors influencing conservation of white winged flufftails in Barga Wetland.

Table 14 Methods used to prevent factors affecting conservation of white winged fluff tails

Variae	Respondents					
Do you know ways to prevent factors affecting white winged flufftails in Barga wetland?	Sex	Yes	%	No	%	N(sample)
	Male	150	65.2	51	22.2	201
	Female	21	9.1	8	3.5	29
	Total	171	74.3	59	25.7	230

As indicated from the below table 15, most of the respondents, awareness were felt between low (17.4%), medium (52.2%), and high (23.9%). This was because, there was site supporting group formed as an association to create an awareness, keep the Wetland turn by turn, but still more awareness creation to the people who were lived near to the Wetland and more work should have to done on an implementation. But, as study indicated, not only relevant information, but also knowledge and awareness on wetlands, are lacking in Ethiopia at all levels (Werema, 2015).

Table 15 Awareness level of respondents about the wise use of white winged flufftails

Variable	Respondents suggestions in	
	Frequency	%
Awareness level of respondents about wise use of white winged flufftails		
a) No awareness	15	6.5
b) Low awareness	40	17.4
c) Medium awareness	120	52.2
d) High awareness	55	23.9

4.5.2. Respondents preference of Barga wetland

4.5.2.1. Future preference of Barga wetland

As indicated from the below results (table 16), (13%) out of 230 respondents have interested to use Barga wetland for farm land. From the total 230 household owners, (16.5%) of the individuals wanted the wetland to be used for grazing land. Around (51.3%) of them needed the wetland to be well protected land in the future, while (19.2%) of participants have wanted the wetland to be used for both farming and grazing lands. The result **was** agree with the **proclaim Ingula** that the uncertainty of how best to manage the future reserve of wetlands (Wang, 2014).

Table 16 Awareness of respondents in future preference of Barga wetland

Variables	Sex			
	Males		Females	
	Frequency	%	Frequency	%
a) Farming land	27	11.7	3	1.3
b) Grazing land	33	14.3	5	2.2
c) Protected area	105	45.7	13	5.6
d) Grazing and Farming	36	15.7	8	3.5

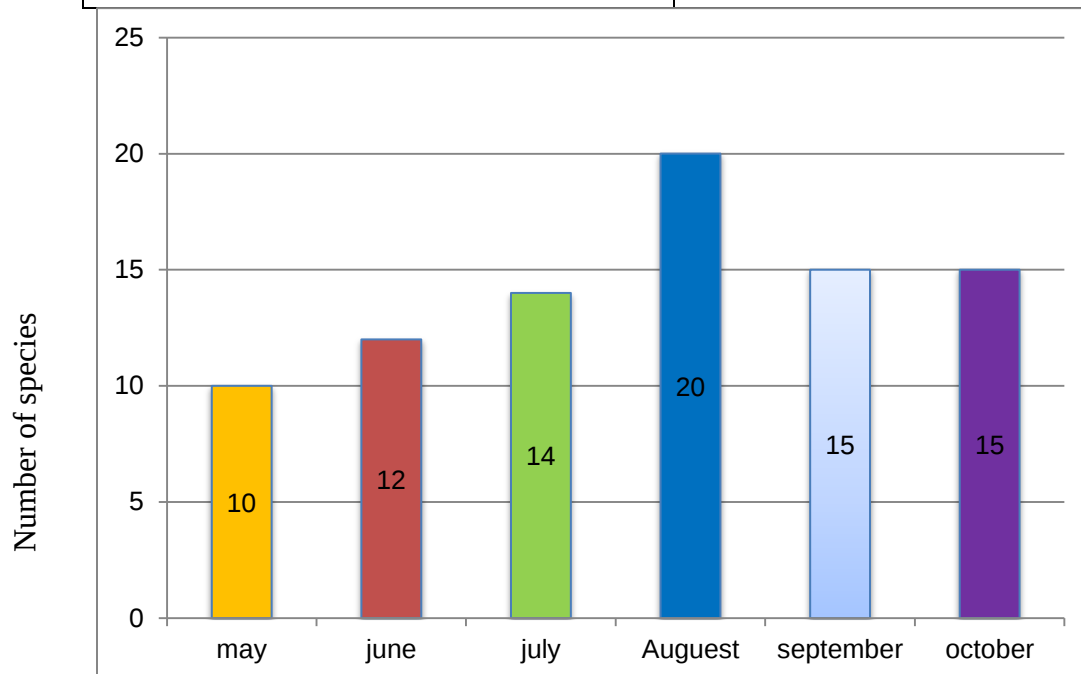
4.6. Population size white winged flufftails

White Winged flufftail in Barga wetland were recorded in different months of the year. Maximum density of grass and water in the wetland during August made it difficult to observe and count birds in the wetland. Total population sizes ranged from 8-20 individuals of White Winged flufftail.

The population size showed difference during the months of the study. The maximum monthly population was recorded in August. The minimum monthly population was recorded in May 8-10 individuals.

Table 17 Population of white winged flufftails in Barga wetland in different months

Months	Population of white winged flufftails in Barga wetland
May	8-10
June	11-12
July	12-14
August	18-20
September	13-15
October	14-15



Maximum monthly population records of white winged flufftail in different months

Figure 4 Maximum monthly population records of White Winged flufftail in Barga wetland.

The highest population records of White Winged flufftail (range 18-20) during the wet season while the lowest record of (range 8-10) were during the dry season (Figure 4). The population size showed that there was a significant difference between dry and wet seasons.

Difference in the number of White Winged flufftail was observed among the three habitats. Grassland, sedges, and forbs habitats grassland had more individuals (12) when



compared to sedges (8) and forbs habitat (5). On the other hand, during the wet season, the number of White Winged flufftail recorded was 15, 11 and 8 individuals in grassland, sedges, and forbs habitats, respectively.

During both seasons, grassland, sedges, and forbs habitats recorded the mean maximum number of 18, 14 and 12 individuals, respectively. Mean minimum number of 7 individuals was recorded in Shallow grassland habitat.

4.7. Nest location and characteristics

During the two breeding seasons in and around Barga wetland habitats, a total of 8 White Winged flufftail nests with 8 breeding pairs were recorded. From the total nests, 5 nests (62.5%) were found in sedges habitats, one nest (12.5%) was found in other grass type and the other two nests (25%) were located in the forbs. The active breeding season of White Winged flufftail in and around Barga wetland habitat was from July to September, when intensive egg laying was observed. Three (37.5%) had their first clutch during July, two (25%) had during August two (25%) had during September, (12.5%) had during October. Of the 8 nests observed, one nest had eggs of unknown clutch size (not determined) i.e. the clutch size were predated by either birds or mammals of prey and one nest had no eggs. The number of eggs per clutch ranged from 1-4 eggs (Table 18).

Table 18 Clutch size of White Winged flufftail in the Barga wetland

Nest number	Clutch size	Months
N1	3	May
N2	2	July
N3	1	July
N4	3	August
N5	No eggs found	August
N6	4	May
N7	3	May

Predominantly used nesting materials were *Eriochloa fatmensis* and *Eriochloa meyeriana*. White Winged flufftail utilized nesting materials from around the nest site. The kind of nesting material is dependent on the type of vegetation near in the nesting area. Breeding pairs cut and pull grasses from the surroundings to build nest. They continuously collect fresh grasses throughout the incubation period.



Figure 5 Nests of White Winged flufftail in different sites



4.8. Hatching success

From the total of 8 nests recorded, only four nests (50%) have hatched chicks, while the other 3 nests (37.5%) were destroyed due to the different factors and one nest had no eggs (12.5%) (Table 19). Re-nesting was not detected. Nest predation by African fish eagle (*Haliaeetus vocifer*) (25.5%), human beings cutting grass (50%) and due to unknown factors was recorded (25.5%). Out of the 8 nests, where 32 eggs were recorded, 22 eggs in six nests were incubated of which only 18 eggs (81.8%) were hatched successfully. White Winged flufftail were observed using different strategies to defend goslings. One strategy was direct confrontation, where one of the parents defends chicks by loud voice or calling, when the other parent led the young hiding in grasses.



Table 19 Nest success of White Winged flufftail in different nest types

Nest location	Successful	Unsuccessful	Inactive	Total
sedges,	4	1	0	5
Forbs	2	0	0	2
Other grass	0	1	0	1
Total	6	2	0	8

4.9. Time budget

A total of 8552 behavioral scans were recorded during 1440 minutes of observations. A total of (62%) scans were conducted in the Sedges habitat whereas (24.45%) and (13.5%) in the forbs and shallow wetland (other grass) habitats, respectively. White Winged flufftail spent most of their time resting (45.6%), followed by foraging (36.76%). They spent 7.67% in comfort movement (preening or stretching). The rest of their time was allocated for locomotion (4.88%), vigilance (2.75%), and social behavior (2.34%).

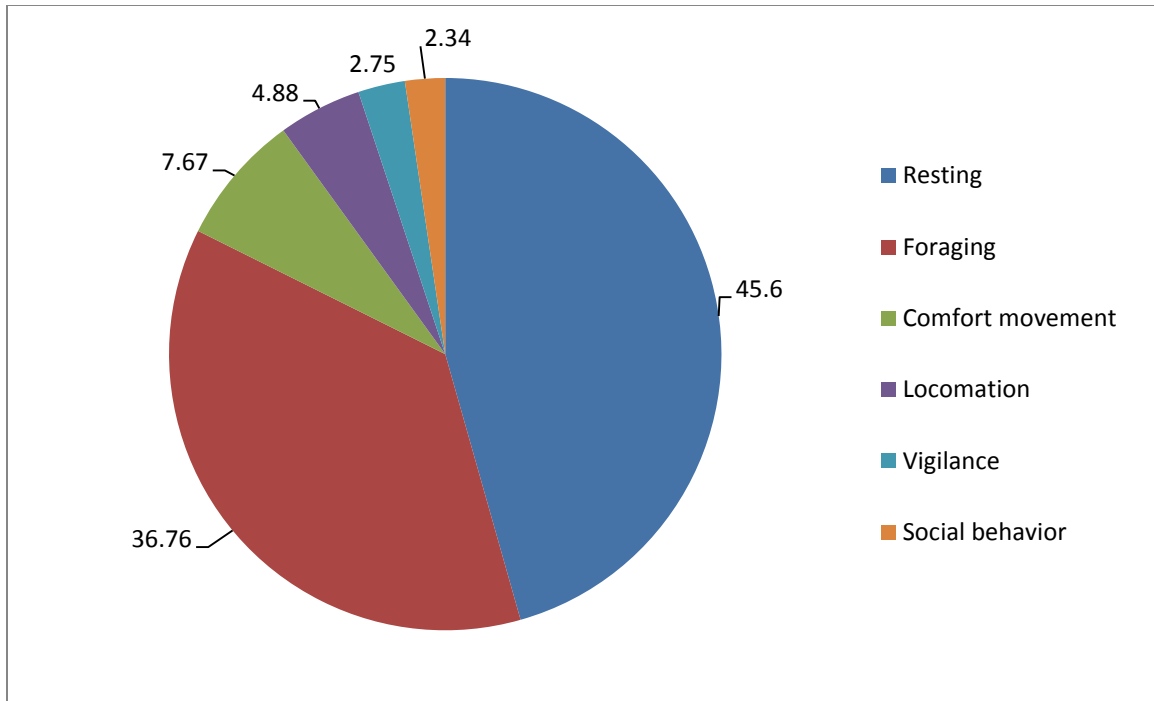


Figure 6 White winged flufftail behavioral activities

The time spent on foraging in three different habitats (sedges, forbs and other grass) showed peak at sedges followed by forbs.

During the dry season, there was a difference in frequency of foraging, resting and comfort movement of White Winged flufftail among the three habitat types. However, there was no difference in the activity level of locomotion, vigilance, social behavior and other behavioral activities among the different habitat types of the study area.

Comparison of behavioral activity in to the three different habitat types during the wet season showed that there was a variation in frequency of foraging, resting, comfort movement and vigilance respectively. However, there was no significant variation in locomotion, social behavior and other behavioral activities among the different habitat types of the study area.

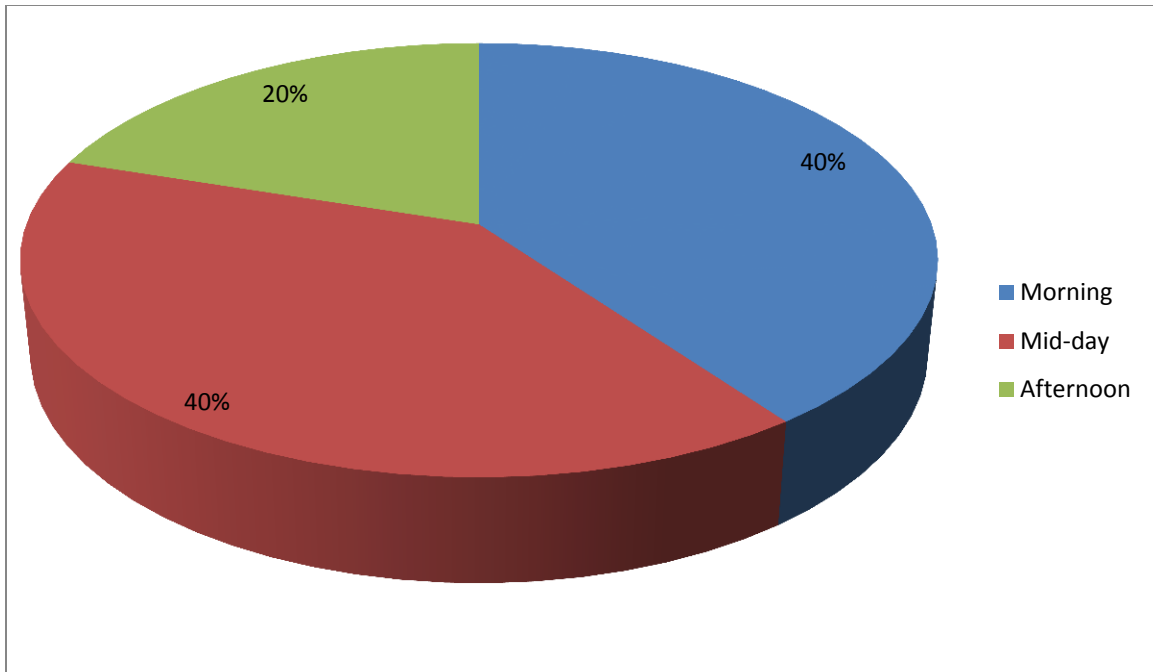


Figure 7 White Winged flufftail foraging time blocks

During dry season, behavioral activities in the three different time blocks showed that foraging activity peaked in the late afternoon hours (16:00 - 18:00 h) and in the morning hours (07:00-9:00 h), while they foraged least during the mid-day hours (11:00-13:00 h). Resting activity peaked during mid-day, followed by morning hours. Locomotion and comfort movements were highly pronounced during the late afternoon hours in the dry season.

During the dry season, time spent for foraging comfort movement vigilance and locomotion activity showed no variation with the time blocks of the day. However, time spent for resting showed a variation with the time blocks of the day. With regard to time spent on social and other behavioral activities, the difference was not across the time blocks of the day and even if the frequency of time spent for the social behavior and other behavioral activities was higher in the morning and in the afternoon than during the mid-day.



During the wet season, foraging activity peaked in the late afternoon (16:00 -18:00 h), followed by morning (07:00-9:00 h) than during the mid-day hours (11:00 -13:00 h). Resting was most frequent during the mid-day hours, followed by morning hours.

In addition, rhythm of vigilance behavior and other behavioral activities peaked in the morning and were less in the mid-day and reached its lowest level in the afternoon during the wet season. Locomotion was significantly higher in the morning than afternoon and mid-day hours.

During the wet season, time spent for foraging, resting, and other behavioral, showed a variation with the time blocks of the day. However, time spent for locomotion, comfort movements and vigilance showed no variation within the time blocks of the day. With regard to time spent in social behavior, the difference was not significant even if the frequency of time spent for the social behavior was higher during the morning than during the mid-day and afternoon hours of observation.

A comparison of different activities between dry and wet seasons showed that, foraging time did not differ between seasons although it was pronounced during the wet season, which is also the breeding season. The time spent for foraging behavior, resting activities, comfort movement and vigilance behavior were not significantly different with the time blocks of the day between the dry and wet seasons respectively. However, time spent for locomotion, social behavior and other behavioral activities were higher during the dry season than the wet season.

4.10. Foraging behavior

White Winged flufftail in Barga wetland were observed feeding on a wide variety of food items, including Insects, crustaceans, and plant seeds. In the surrounding farmland habitats of Barga wetland, White Winged flufftail mainly fed on Insects, crustaceans, and plant seeds.



White Winged flufftail feed at the middle of wetland than in the edge for better protection from their predators. Large grasses prohibit observation; therefore, shorter grasses were more preferred. During the brief periods of the day when they return to the wetland from the grassland habitat, they feed predominantly on the grasses and seeds of different plants.

During the dry season, the maximum percentage of foraging food items of White Winged flufftail was plant seeds (76.88%), followed by crustaceans, (16.72%), and insects (6.4%). During the wet season, the highest percentage of White Winged flufftail diet constituted insects (29.65%) and crustaceans (70.35%) (Graph8).

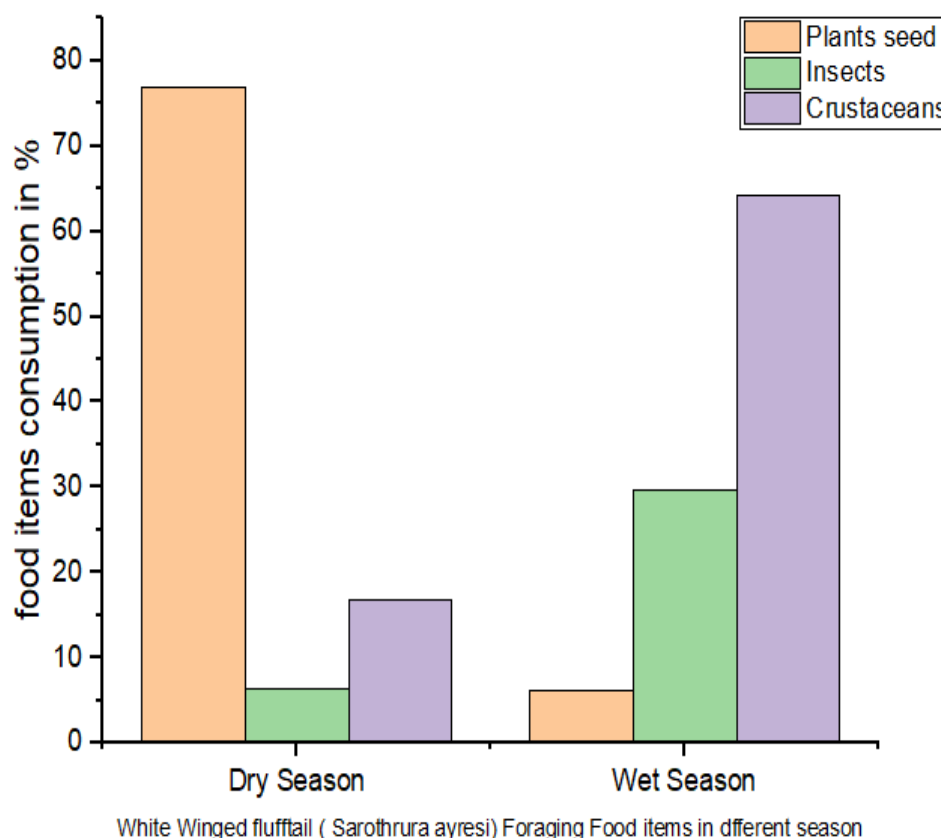


Figure 8 food items consumed by White Winged flufftail during dry and wet seasons

The most frequently used foraging habitat of White Winged flufftail was Sedges (72.7%), followed by forbis habitat (16.52%), shallow water (10.78%) during the dry season. During the wet season, the most frequently used habitat of foraging was shallow water (52.54%), followed by Sedges (35.64%), and forbis (11.82%) (Graph8).

4.11. Attitude of local people towards White Winged flufftail

4.11.1. Livelihood activities and Contact with White Winged flufftail

Majority of the respondents (90%) were dependent on farming and cattle herding, where 85.9% had no alternative income sources. Few of the respondents (12%) reported grass damage by White Winged flufftail, whereas, 88% did not report any grass damage.



Among the respondents, 12% reported that White Winged flufftail were more harmful during the wet season than any other period of the year. In addition, 60% of the respondents who suffered grass damage considered White Winged flufftail as a pest, which causes damage to grass by adding their nests. The main grass types primarily damaged by White Winged flufftail were Sedges and Forbs.

4.11.2. Perception of respondents to wetland and wetland resources

Majority (70%) of the respondents living around the wetland habitat had good awareness about the potential benefits from wetlands for their survival and the rest have responded as it had nothing to do to their survival.

As indicated on figure below, (38.7%) of respondents have interested to use Barga wetland for drinking cattle, (29.1%) for grazing, for cutting grass (20%), (10.4%) for irrigation and (1.7%) did not replied any answer.

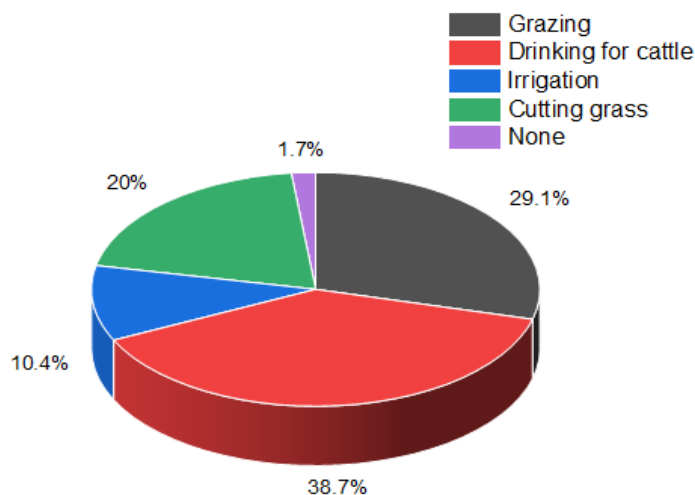


Figure 9 Respondents' view on the benefits of Barga wetland



Most of the respondents (63.3%) reported that they get high levels of benefits from the wetland and as 33.3% and 3.3% reported that they get medium and low level of benefits from the wetland habitat. Majority of the respondents (80%) believed that if any conservation activity is made in the wetland, their livelihood would have been improved.

Most respondents (83.33%) believed that the wetland and surrounding habitats do not face any threat. But, the wetland is under extensive pressure from human encroachment (20%) and associated agricultural expansion (20.8%) and both human encroachment and associated agricultural expansion (26.95%) in the surroundings. Overgrazing is also a threat to the wetland as the area has shown a 32.17% increase in the number of cattle population only in the last 5 years (Table20).

Table 20 the major human induced factors which may cause threats to the wetland.

Human factors	Number of respondents	Per cent (%)
Human encroachment	46	20
Agricultural expansion	48	20.8
Both human encroachment and agricultural expansion	62	26.95
Overgrazing	74	32.17

Most of the respondents (70%), living around the wetlands were willing to participate in a community-based conservation activities, without any support from the government body or from non-governmental organizations. The majority (58.5%) of the respondents living around the wetland have the knowledge of sustainable natural resource utilization and wetland conservation activities. But, only 53.34% of the respondents have been previously involved in natural resource conservation activities (Table 21).



Table 21 Farmers' participation in different biodiversity conservation activities in Barga

Conservation activities	Frequency	Percent (%)
Soil and water conservation	45	19.56
Afforestation	76	33
Both Soil and water conservation and afforestation	87	37.82
None	28	12.17

Human - wildlife conflict incurs a substantial amount of economic cost to farmers. Grass damage by wildlife affects livelihoods of local farmers (Tryjanowski, 2015). In addition, regardless of the economic loss, human - wildlife conflict has impact in supporting negative attitude among farmers and other stakeholders against wildlife. Experimentally measures perceptions of local people towards White Winged flufftail by users and residents of a golf estate in the Western Cape. They concluded that White Winged flufftail were viewed as pests by the few of respondents with 14% considering White Winged flufftail as problem birds. But, the attitude and perception of some farmers to the species and wetland habitat were not negative. This could be due to low level of damage as a result of small population during the wet season in farmland habitat, which might be very easy to protect. (Tryjanowski, 2015) stated that perception and attitude of farmers to White Winged flufftail damage are dependent on the extent of loss they make to their farms in the area.



5. CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion

Findings of this investigation showed that White Winged flufftail require a protected and undisturbed area for breeding, as they are very sensitive for disturbances. For breeding, they prefer an area, which has an elongated rainy season, food resource as well as sedges, grasses, forbs and Shallow water to construct their nests. White Winged flufftail utilize nest materials collected from in and around the Barga wetland areas. The presence of adequate vegetation or grass cover, water depth, availability of food for chicks, and less chance of human disturbances and animal contact were determinant factors for White Winged flufftail breeding performance and survival in Barga wetland and nearby areas.

Therefore, protection and conservation of White Winged flufftail and their habitats should be matched and associated with the peak nesting and breeding time during the rainy season. Most of the time, they spent resting and feeding in the Sedges, shallow wetland and Forbs in Barga wetland. Barga wetland harbours the largest population of White Winged flufftail and supports the population for longer period of time providing a food resource and roosting sites.

The types of food resources distributed in the study area differ spatially and seasonally. The type of food preference by White Winged flufftail might be associated with the foraging behavior as the functional structure of a bird influences the type of food consumed. During the breeding time, the wetlands are more important places because the chicks are entirely dependent on it to get all the requirements until they fledge. The habitats and seasons have affected the distribution of White Winged flufftail across the study area significantly. It is common to find maximum number of White Winged flufftail during the wet season than the dry season.

Local farmers in the surroundings of Barga wetland are suffering grass damage by White Winged flufftail, and hence their attitude towards the species is negative. Moreover, the local farmers living around Barga wetland are not aware of the value of the wetland and wetland bird species for conservation. The wetland is under threat due to heavy



sedimentation from the surroundings. Furthermore, the natural flow of water from the wetland has been changed by draining the wetland to control flooding.

5.2. Recommendations

Therefore, the following recommendations are suggested to conserve Barga wetland habitat and wetland bird species including White Winged flufftail;

- ❖ In the Barga wetland habitat, grazing inside the wetland should be controlled.
- ❖ Habitat restoration programme should be implemented in Barga wetland area to rehabilitate natural food items and nest places of the White Winged flufftail.
- ❖ GIS-based land-use/land-cover changes in and around Barga wetland should be conducted in order to evaluate land-use/land-cover pattern changes in the past and to take corrective measures.
- ❖ Barga wetland is one among the 69 important bird areas and is known as a Key Biodiversity area harboring a large diversity of birds. The area is known for having a large aggregation of White Winged flufftail. An ecotourism project, which can enhance the socio-economic status of local community through active participation, should be considered.
- ❖ Awareness creation among the local communities should be carried out to understand the essence of conservation and sustainable use of natural resources in the Barga wetland area.
- ❖ More research on biodiversity components, including the wet season, is required.
- ❖ To conserve and protecting the White Winged flufftail populations and nests, it is necessary to safeguard these wetland habitats through raising community awareness.
- ❖ To limit the level of disturbance at the study sites, a controlled grazing system should be adopted.



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Appendix

Household survey questionnaires and focus group discussion questionnaires

Instruction

This questionnaire refers to the household and should be administered with the head of household and was presented for focus group discussions.

The purpose of the interview is to identify the assessment of community awareness on ecology, conservation and distribution of white winged flufftails at Barga Wetland. The idea of the respondents on how the community awareness on ecology, conservation and distribution of white winged flufftails at Barga wetland give will help to draw conclusions and recommendations for this study.

I: General information

1. Enumerator

1.1 Name of the enumerator:

1.2 Signature of the enumerator:

Sign-----Date-----

II: Identification of the respondent:

2.1 Zone-----2.2 Districts-----2.3 Kebele-----

2.4 Name of respondent or code: -----2.5 Ages-----

2.6 Sex (): 1. Male---0. Female-----

2.7 Educational level completed by respondents ()

1) No formal education-----2) 1-4 grade---3) 5-8 grade---4) 9-12 grade---5) Grade 12 completed---6) Diploma---

2.8 Marital status of the respondent: (Choose)

a) Married b) Unmarried c)-Divorce

2.9 .Major occupation: a) Farmer---b) Merchant---c) At present----

2.10 Religion of the respondent ()

1) Orthodox-----2) Protestant-----3) Wakefata ----4) Muslim ----

2.11 Family size of the household

Age	Male	Female	Total
15-30			
31-64			
Greater than 64			

Questions

1. What is your awareness about the availability of white winged flufftails in Barga wetland?
 - a) Throughout the year in the wetland
 - b) Twice in a year
 - c) From the end of June to the end of October
2. Do you know any places where the white winged flufftails distributed in Ethiopia?

If you say yes list the names of wetlands.
3. Do you have any information about feeding items of white winged flufftails? Yes/No

If yes, list the types.
4. Do you have any awareness about white winged flufftails interactions with other birds at Barga wetland?
5. How do Barga water fowls interact with other livings in this wetland?
 - a) Free living with other living things
 - b) Hiding themselves in the sedges in breeding seasons
 - c) No interaction with other living
6. Do you know factors that influence the conservation of white winged flufftails at Barga wetland?

If you say yes give your ideas.
7. Are there any natural phenomenon's that influence conservation of white winged flufftails in Barga wetland? If yes give your ideas.
8. Which factors more affect white winged flufftails in Barga wetland?



9. How do you perceive the availability of white winged flufftails in Barga wetland?

a) Increase b) Decrease; If the answer is decrease, why?

10. What benefits do the white winged flufftails provide to you?

11. Are there any methods that might enable you to overcome that influence these birds distribution in Barga wetland? Yes/no. If yes, give your ideas.

12. Is there any protection for white winged flufftails in Barga wetland? Yes---No—

If you say yes, is there any role played by you to keep the birds in the wetland?

13. Your awareness on the use of white winged flufftails at Barga wetland:

a) No awareness b) Low awareness c) Medium awareness d) High awareness

14. In Barga wetland area, what is your preference the wetland to be in the future?

a) Farming land b) Grazing land c) Protected area d) Grazing and farming

15. Do you have any awareness about white winged flufftails at Barga wetland? Yes/ No. If you say yes write your ideas. -----

16. List the general behavior of white winged flufftails.

17. Do you have any awareness on the ecology of white winged flufftails at Barga wetland?

Yes____/ No-----

If yes give your ideas about the interactions of the white winged flufftails with other birds in Barga wetland.

18. At what time can the white winged flufftails be seen well?

a) Any time b) At flight c) At rest time

Thank you.

By: Diribi Defar Bodena

Sample of White Winged Flufftails at Barga Wetland



Discussion with public about conservation of winged flufftails at Barga wetland and Barga Wetland





Grazing cattle's deteriorated breeding site of White Winged Flufftail