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**RESEARCH ARTICLE**

# Population fluctuation, Species variation and habitat utilization pattern of water birds belongs to the family Rallidae, Jacanidae and Charadriidae at selected perennial and non-perennial water bodies of Nalgonda district of Telangana State

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## *Manuscript Info* *Abstract*

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The present study was aimed to study the population fluctuation species variation and habitat utilization pattern of small and medium sized wetland birds belonging to the families Rallidae, Jacanidae, and Charadriidae at selected water bodies in Nalgonda of Telangana state. The perennial and non-perennial water bodies provide food, shelter, nesting and breeding for many winter and local birds. The population and species richness of these families showed difference in relation to perennial to non-perennial tanks during the study period. A total of 8 species belongs to family Rallidae were recorded at perennial tanks, among which the maximum mean value was recorded for Coots (292.4 ± 119.84) at Dameracharla and the minimum was for Little Crake (3.75 ± 1.91) at Vemulakonda tank. Whereas, in non-perennial tanks the maximum number of coots (86.7l ± 60.67) were recorded at Raigir tank and the minimum number (35.79 ± 14.78)was atBhongir tank. In case of family Charadriidae, a total 9 species were recorded at both perennial and non-perennial tanks. The maximum mean number at perennial tanks was observed for Common Sandpiper at Thummalaguda (208.79 ± 244.04) and minimum for Kentish plover (12.2±6.34) at Vemulakonda, while in non-perennial tanks maximum mean number was observed for little ringed plover (36.29 ± 18.91) and minimum in Green shank (4.75 ± 2.22) at Raigir tank. The percent habitat utilization pattern of different water birds showed similar trend in relation to availability of various habitat types at both the situations.



## Introduction

The family Rallidae belongs to the order Gruiformes and includes 17 species of Rails & coots. They are mostly small to medium sized marsh or water birds with some terrestrial forms (Ali and Ripley, 1983). These birds in general poor fliers and mostly nest on the ground, in bushes or floating water. The common species include, White breasted water hen (*Amaurornis phoenicurus*), Common moorhen (*Gallinula chloropus*), Purple moorhen (*Porphyrio porphyrio*) and Common coot (*Fulica atra*) are widely distributed throughout the subcontinent, while the remaining have restricted distribution. The Jacanidae represented with 2 species and mostly common with uniform distributions in all the habitats. The family Charadriidae belongs to the order Charadriformes representing with 64 species. These are wading birds of small to medium size mostly found in all water bodies and also all along the coastline. Out of all the species only two species viz Red-wattled lapwing (*Vanellus indicus*) and Yellow-wattled lapwing (*Vanellus malabaricus*) are resident and local migrants in nature and all other species are mostly local or winter migrants.

Several workers have carried out studies on the population counts of these group of birds during mid-winter water bird census across the country (Mohit *et al.*, 2014, Malabika *et al*., Garg *et al.*,2013, Ragavaiah and Davidar, 2006, Jaksic, 2004, Hussain, 1995). Ali and Ripley (1983) have given in brief descriptions and ecology of Rallidae, Jacanidae and Chardriformes in general. No detailed information is available on the population trends and habitat use by these three families in India excepting brief reports on the waterfowl census at several locations. Hence, the present paper deals with our observations on population fluctuation, species variation and habitat utilization of family Rallidae, Jacanidae and Charadriformes at selected water bodies of Nalgonda district of Telangana state.

**Study Area**

Nalgonda district lies in the southern part of Telangana state, between longitudes 78$^{o}$ 40' - 86° 5' E and latitudes 16° 25' - 17° 5' N (Fig.1). Rivers Kshina, Musi, Aler, Dhindi, Hallia, Kangal and Peddavagu and their inter-connecting channels account for a large number of reservoirs, lakes and tanks in this region of both perennial and non-perennial nature. Nalgonda district enjoys semi-arid type of climate, characterized particularly by hot summer and a low degree of humidity except during the southwest monsoon between June-September (Average rainfall 598.7 mm) and the northeast monsoon between October-February (Average rainfall 123.72 mm) with an average maximum and minimum of 43°C during the month of May and drops to the minimum of 10°C in the month of December, with average maximum and minimum ranging between 30°C and 14°C. The average relative humidity recorded at 8.30 A.M. ranged between 31 to 77% during the study period.

Four tanks of both perennial and non-perennial categories were taken up for the investigation and monitored during the study period spanning from November 2008 to March 2011. These tanks are Thummalaguda tank (5), Vemulakonda tank (6), Dameracherla tank (8) and Solipet tank (7) of the former category, and Raigir tank (2), Bhongir tank (1), Atmakur tank (4) and Anantharam tank (3) of the study tanks are dealt elsewhere (Vasudeva Rao *et al.*, 1996).

## Methods:

The populations of aquatic avifauna visiting these tanks were regularly monitored from November to March every winter during the study period spanning three years from 2008 to 2011, following the total count method outlined by Gaston (1973) and Steward and Kantrud (1972). Regular observations and all the counts were made during the early hours of the day, that is, between 6.00 AM and 11 AM, the bird species encountered were recorded with the help of 8X40 spotting binoculars and counted with a 20X40 spotting scope. Identification was done with the help of Ali and Ripley (1983b).Habitat preference of small and medium sized waders at the study tanks in relation to the frequency of sightings were calculated using following formula:

$$\frac{\text{Total number of sightings of individual species in one habitat}}{\text{Total number of sightings of all species in the same habitat}} \times 100$$

The percentage habitat use of different species in the family Rallidae, Jacanidae, and Charadriidae were calculated separately. Observations used in the analysis of habitat use were restricted to undisturbed active bird species. For practical reason observations were carried out only during the day time. All the species were treated separately the analysis to determine whether there is any significant difference in their use of habitat.

## Results and Discussion

**Family: Rallidae**

A total of 8 species of Rails, Crakes, Moorhens and Coots were recorded in both the perennial and non-perennial tanks. These birds are medium sized and are more adapted to marsh habitat. These birds feed on all types of insects and vegetable matter. All the recorded bird species are resident that breed on floating vegetation or in the reed beds of the tanks. Among the 8 species, the common and dominant species were Moorhens and Coots in all the tanks. The maximum mean value of 292.4 ± 119.84 was recorded for Coots at Dameracharla and the minimum of 3.75 ± 1.91 was for Little Crake at Vemulakonda tank (Table 1). In this family, the maximum mean of Purple Moorhens was recorded (187.73 ± 95.49) in Dameracharla and (79.67 ± 41.99) in Vemulakonda. Indian Moorhens ranged from 32.77 ± 15.84 (Thummalaguda) to (19.45 ± 5.79) (Solipet) and Coots from 292.4 ± 119.84 (Dameracharla) to 178.53 ± 90.97 (Thummalaguda). These were the dominant bird populations with flock size varying from 1-3, 3-20 and 21-350 birds respectively.

At non-perennial tanks, Coots and Moorhens are predominantly represented while other birds recorded in low numbers. The maximum number of coots (86.7l ± 60.67) at Raigir tank and minimum number was (35.79 ± 14.78) at Bhongir tank recorded during the study period. Whereas Purple Moorhen was recorded maximum (3l.08 ± 6.66) at Raigir and the minimum number was (21.69 ± 8.l5) at Anantharam. The other tanks showed

significantly less number of these two species. The other bird, White-breasted Waterhen (22.15 ± 16.64) was recorded maximum at Atmakur tank (Table 1).

The percentage composition of these birds in different tanks during the study period at perennial and non-perennial tanks is depicted in the Fig 2 & 3. Among the birds, Coots showed significantly high percentage in all the months during the study period in all perennial tanks. Maximum percent was recorded at Vemulakonda (87.7%), followed by Thummalaguda (66.5%) with a total percent of 76.3% at Vemulakonda (Fig2). Moorhen was recorded maximum percent at Thummalaguda (46%) followed by Dameracharla (53.5 %). The other birds showed similar trends in all the tanks (2.8 – 50%) during the study period. At non-perennial tanks Coots showed significantly high during the 2009-10 at Bhongir (35.4 – 100%). The Moorhen percent was recorded high at Anantharam (58.6%) followed by Raigir (13 – 62.5%) and Atmakur (14.9 to 74.1%) (Fig. 4).The overall percent of coots in all the tanks during the study period showed 40.6 – 81.7%, whereas Moorhens showed 12.5 – 38.7% (Fig. 4). The other birds constitute 5.8 – 35.5% at non-perennial tanks.

The Coots and Moorhens are adapted to highly artificial habitat and are able to tolerate regular human activity in the perennial and non-perennial tanks. In Coots, the higher population in both the areas is mainly due to easy adaptability and quick dispersal with the vegetation. Similar observations were made at Kolleru by Anjaneyulu (1991). Ryan and Dhysmore (1979) briefly summarized the habitat preferences and the breeding of American Coots elsewhere. More congregations of Coots were observed in the undisturbed habitat when the summer approaches, and good number of Coots moved to the areas where the water is maintained almost throughout the year. Coot breeding was observed from late July to September. Nests are seen on the free floating vegetation of the tanks. Considerable work has been done on Rallidae which includes American Coot (*Fulica americana*), Common Moorhen (*Gallinula chloropus*), Virginia Rail (*Rallus limicola*), King Rail (*Rallus elegans*) and Black Rail (*Laterallus jamaicensis*). The habitat preferences in relation to vegetative features and water depth variations were studied by Fredrickson et al., (1986).

**Family: Jacaniidae**

Along legged and elongated tied water bird adapted to walk lightly over floating leaves and vegetation. Two species, Pheasant-tailed Jacana and Bronze-winged Jacana were recorded in perennial tanks. But at non-perennial tanks, there were no sightings of these birds. This may be due to the non-availability of suitable vegetative features. The Pheasant tailed Jacanas mean population varied from 22.27 ± 8.8 to 39.29 ± 19.39 with the flock size of 2-15 birds whereas Bronze-winged Jacanas mean varied from 12.5 ± 1.97 to 30.5 ± 12.05 with a group size of 1-8 birds (Table 1). Jacanas population fluctuations were similar to that of Moorhens and Coots in all the perennial tanks. These populations were fairly constant in all months throughout the year. The representation of low populations in these tanks is mainly due to non-availability of suitable vegetation features. Similar observations were recorded at Kolleru (Anjaneyulu, 1991).

**Family: Charadriidae**

In the present study, a total of 9 species were recorded. These are groups of small sized birds that inhabit mudflats and shallow water of the areas and watered agricultural fields. These birds mostly feed on small invertebrates, mollusks, insects, worms and some vegetable matter obtained by probing mud (Mukherjee, 1972). Among the 9 species, all are winter migrants except Red-wattled Lapwing which is the resident species. These species generally move singly or in pairs distributed in cultivated fields after harvesting on the elevated bunds as well as fallow lands, edges of fresh water pools and tanks (Anjaneyulu, 1991). The maximum mean number of Common Sandpiper was higher in Thummalaguda (208.79 ± 244.04) followed by Red-wattled Lapwing (124.92 ± 139.31) and Ringed Plover (89.93 ± 77.22), whereas in other tanks, Ringed Plover was recorded (82.07 ± 67.61 to 86.9 ± 71.45) maximum in number followed by Little Ringed Plover (82.2 ± 68.6 to 41.07 ± 22.27), Common Shank (42.7 ± 24.66 to 22.87 ± 11.5) and Little Stint (31.67 ± 20.4 to 17.08 ± 4.23). At non-perennial tanks, Ringed plover 36.5 ± 20.7 (Raigir) to 21.9 ± 14.5 (Bhongir), Little ringed Plover 36.5 ± 18.9 (Raigir) to 20.79± 7.18 (Atmakur) followed by Wood Sand Piper 25.57 ± 17.54 (Raigir) to 14.43 ± 2.9 (Atmakur) and Little Stint 24.79 ± 16.34 (Atmakur) to 14. 91 ± 3.7 (Raigir) showed significant numbers (Table.2). All the waders migrate to these areas during the month of October to April and their percentage composition in all the perennial and non-perennial tanks during the study period was represented in Figure 4&5. During the study period at perennial tanks, the maximum percentage was observed during the year 2010-11 (35.7 to 62.32) in all the tanks and the low percentage was recorded during 2008-09 (17.6 to 26.4). At non-perennial tanks the maximum percent was observed during the period 2009-10 (25.2 to 44.3). However during 2008-09 at Anantharam 44.3% was recorded.

Population dynamics of shore birds including Sandpiper, Plovers, Stints and other waders were studied

by Evans and Pienkowski (1984) in European region. Most of the waders consume 89% of the animal matter consisting of tiny insects, crustaceans and mollusks and 6% of vegetable matter as seeds of various aquatic plants and the remaining 4.85% consists of sand and tiny shells (Ali and Ripley, 1987). A large gathering of waders was recorded in shallow water or mudflats. These species change their habitat very frequently in accordance to the food availability (Anjaneyulu, 1991). The maximum flock size was recorded for Little Stint (6-116) birds followed by Little Ringed Plovers (2-128). The Common Sand Piper (2-40), Kentish Plover (2-28) and Wood Sandpiper (2-160). The remaining waders consisted of low population with minimum range and the species were observed to feed with other waders. The low fluctuation in number of birds in this family at perennial and non-perennial tanks is mainly due to the changing habitat features and also many other sites remain unexplored in these areas.

**Habitat utilization by waterfowls at perennial and non-perennial tanks**

Many habitat types may occur within an area. Yet a bird may utilize only a few of these. Most of the birds are strictly confined to particular habitat where abundant natural food and suitable micro habitat exist (Anjaneyulu, 1991). In the present study 7 habitats were identified at perennial and non-perennial tanks. The habitat distribution of various species in different habitats was analyzed. The species distribution versus various habitats has been illustrated in figure 6 & 7.

In perennial tanks the species belongs to family Rallidae was majorly observed in Floating water (42.4%), followed by Reed areas (32.8%), Open water (13.3%) and Shallow water (11.5%). The family Jacaniidae was also observed maximum in Floating vegetation (34.8%) followed by Reed areas (28.2%), Wet borders (21.7%) and Agriculture areas (15.3%),while the family Charadriidae was recorded highest in Wet borders (46.9%), followed by Marginal areas (37.7%) and Agriculture areas (15.4%). In non-perennial tanks the species belongs to family Rallidae was observed maximum in Reed areas (40.4%), followed by Floating water (32.6%), Shallow waters (11.7%), Open water (10.2%) and Marginal areas (5.1%) and the family Jacanidae was observed maximum in Agriculture areas (40.3%),followed by Wet borders (34.6%), Floating vegetation (14.7%) and Reed areas (10.4%). The family Charadriidae was recorded highest in Wet borders (49.6%), followed by Marginal areas (26.4%), Agriculture areas (15.2%), Shallow water (5.3%) and Open water (3.5%). The variation in the utilization pattern of these tanks is mainly attributed to the availability of preferred food and also other a biotic and biotic factors.

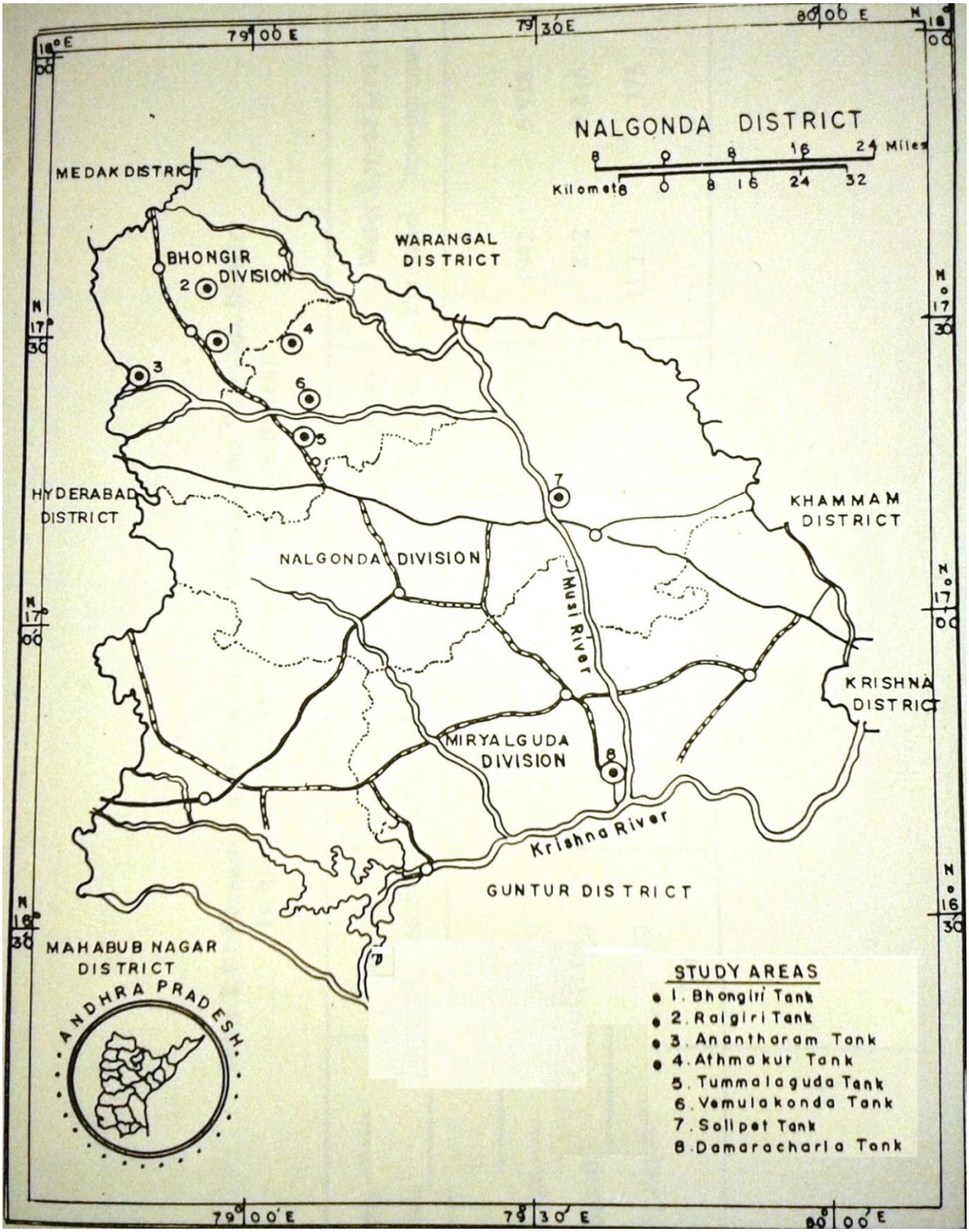
Table 1: Species Variation in the family Ralidae, Jacanidae at Perennial and Non- Perennial tanks during the study period.

| FAMILY/SPECIES | Perennial tanks | | | | Non-perennial tanks | | | |
|---|---|---|---|---|---|---|---|---|
| | THUMMALA GUDA | VEMULAKONDA | DAMERACHERLA | SOLIPET | RAIGIR | BHONGIR | ATMAKUR | ANANTHARAM |
| | Mean ± SD | Mean ± SD | Mean ± SD | Mean ± SD | Mean ± SD | Mean ± SD | Mean ± SD | Mean ± SD |
| **Rallidae** | | | | | | | | |
| Water Rail | 5.93 ± 3.29 | 4.75 ± 1.91 | 5.2 ± 2.25 | 18.11 ± 17.79 | - | - | - | - |
| Little Crake | 4.64 ± 1.91 | 3.75 ± 1.91 | 7.3 ± 3.2 | 14.9 ± 4.89 | - | - | - | - |
| Brown Crake | 6 ± 3.62 | 4.75 ± 1.83 | 8.1 ± 4.01 | 23 ± 12.04 | - | - | - | - |
| White Breasted Water Hen | 50 ± 11.38 | 27.5 ± 11.28 | 46.27 ± 22.45 | 49 ± 17.73 | 15.4 ±7.04 | 12.85 ± 6.83 | 22.15 ± 16.64 | 13.93 ± 3.95 |
| Water Cock | 64.8 ± 32.72 | 43.67 ± 21.56 | 40.27 ± 26.71 | 66.2 ± 35.31 | - | - | - | - |
| Indian Moor Hen | 32.77 ± 15.84 | 24.57 ± 7.28 | 25 ± 18.9 | 19.45 ± 5.79 | - | - | - | - |
| Purple Moor Hen | 125.8 ± 54.23 | 79.67 ± 41.99 | 187.73 ± 95.49 | 130.67 ± 56.19 | 31.08 ± 6.66 | 22.62 ± 6.17 | 29.07 ± 12.65 | 21.69 ± 8.15 |
| Coot | 178.53 ± 90.97 | 231.57 | 292.4 ± 119.84 | 190.13 ± 116.65 | 86.71 ± 60.67 | 35.79 ± 14.78 | 45.54 ± 18.64 | 41 ± 16.59 |
| **Jacanidae** | - | - | - | - | - | - | - | - |
| Pheasen Tailed Jacana | 39.29 ± 19.39 | 30.515.96 | 30.55 ± 10.8 | 22.27 ± 8.8 | - | - | - | - |
| Bronze Winged Jacana | 30.5 ± 12.05 | 20.13 ± 10.52 | 15.17 ± 3.06 | 12.5 ± 1.97 | - | - | | - |

**Table 2:** Species Variation in the family Charadriidae at Perennial and Non- Perennial tanks during the study period.

| SPECIES | Perennial tanks | | | | Non-perennial tanks | | | |
|---|---|---|---|---|---|---|---|---|
| | THUMMALA GUDA | VEMULAKONDA | DAMERACHERLA | SOLI PET | RAIGIR | BHONGIR | ATMAKUR | ANANTHARAM |
| | Mean ± SD | Mean ± SD | Mean ± SD | Mean ± SD | Mean ± SD | Mean ± SD | Mean ± SD | Mean ± SD |
| **Red wattled lapwing** | 124.92 ± 139.31 | 114.54 ± 128.94 | 25.73 ± 7.26 | 36.38 ± 17.21 | 13.5 ± 3.73 | 14.08 ± 7.08 | 14.67 ± 3.65 | 9.38 ± 2.87 |
| **Ringed Plover** | 89.93 ± 77.22 | 85.14 ± 43.66 | 82.87 ± 67.61 | 86.92 ± 71.45 | 36.5 ± 20.74 | 21. 91 ± 14.52 | 33.88 ± 23.37 | 30.08 ± 17.21 |
| **Little Ringed plover** | 50.47 ± 25.2 | 82.2 ± 68.68 | 47.14 ± 15.04 | 41. 07 ± 22.27 | 36.29 ± 18.91 | 29.67 ± 15.43 | 20.79 ± 7.18 | 21.29 ± 7.71 |
| **Kentish Plover** | 25.14 ± 30.5 | 12.2 ± 6.34 | 12.9 ± 3.28 | 22.2 ± 9.7 | 25 ± 7.48 | 11.9 ± 4.18 | 10.8 ± 2.39 | 16.6 ± 8.83 |
| **Common Redshank** | 22.87 ± 11.51 | 42.2 ± 24.66 | 23.29 ± 7.57 | 34.85 ± 20.49 | 17.25 ± 5.5 | 16.4 ± 3.76 | 17.08 ± 5.6 | 17 ± 5.78 |
| **Green Shank** | 47.22 ± 33.32 | 22.56 ± 11.14 | 10.6 ± 3.71 | 57.5 ± 29.01 | 4.75 ± 2.22 | 12.29 ± 6.45 | 28 ± 8.91 | 14.33 ± 2.08 |
| **Wood Sand Piper** | 34.92 ± 13.89 | 39 ± 10.93 | 34.93 ± 19.6 | 28.42 ± 12.72 | 25.57 ± 17.54 | 18.14 ± 7.87 | 14.43 ± 2.9 | 15.79 ± 2.83 |
| **Common Sand Piper** | 208.79 ± 244.04 | 35.27 ± 18.58 | 39 ± 17.51 | 25.69 ± 10.42 | 25.47 ± 9.86 | 21.86 ± 8.81 | 27.29 ± 11.72 | 22.07 ± 10.48 |
| **Little Stint** | 18.08 ± 6.07 | 31.15 ± 13.53 | 17.08 ± 4.13 | 31.67 ± 20.04 | 14.91 ± 3.7 | 19.85 ± 6.95 | 24.79 ± 16.34 | 21.38 ± 14.15 |

Fig. 1**:** Map showing Study Area with perennial and non-perennial tanks.



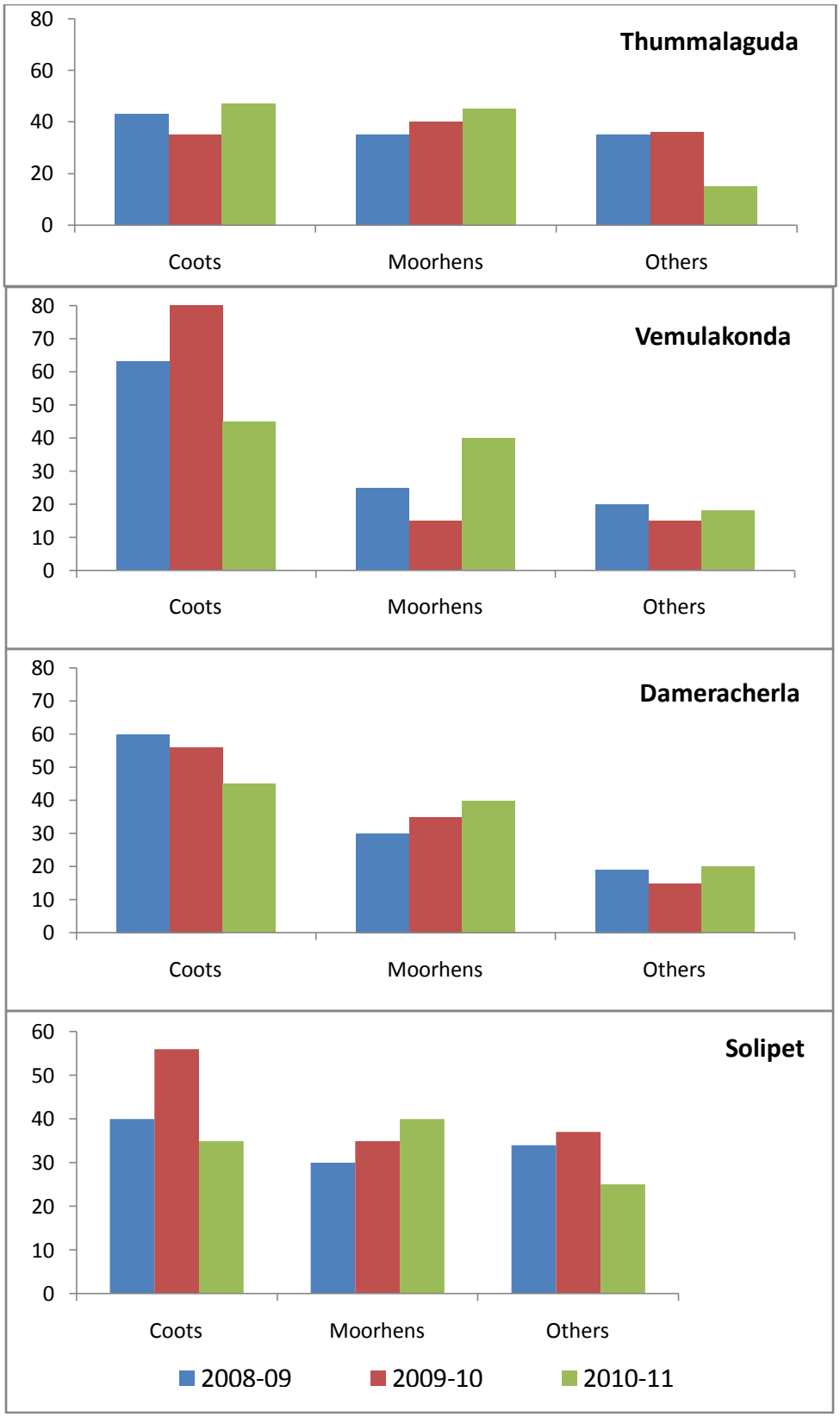



Fig. 2: Percent composition of coots, moorhens and others in perennial tanks during the study period.

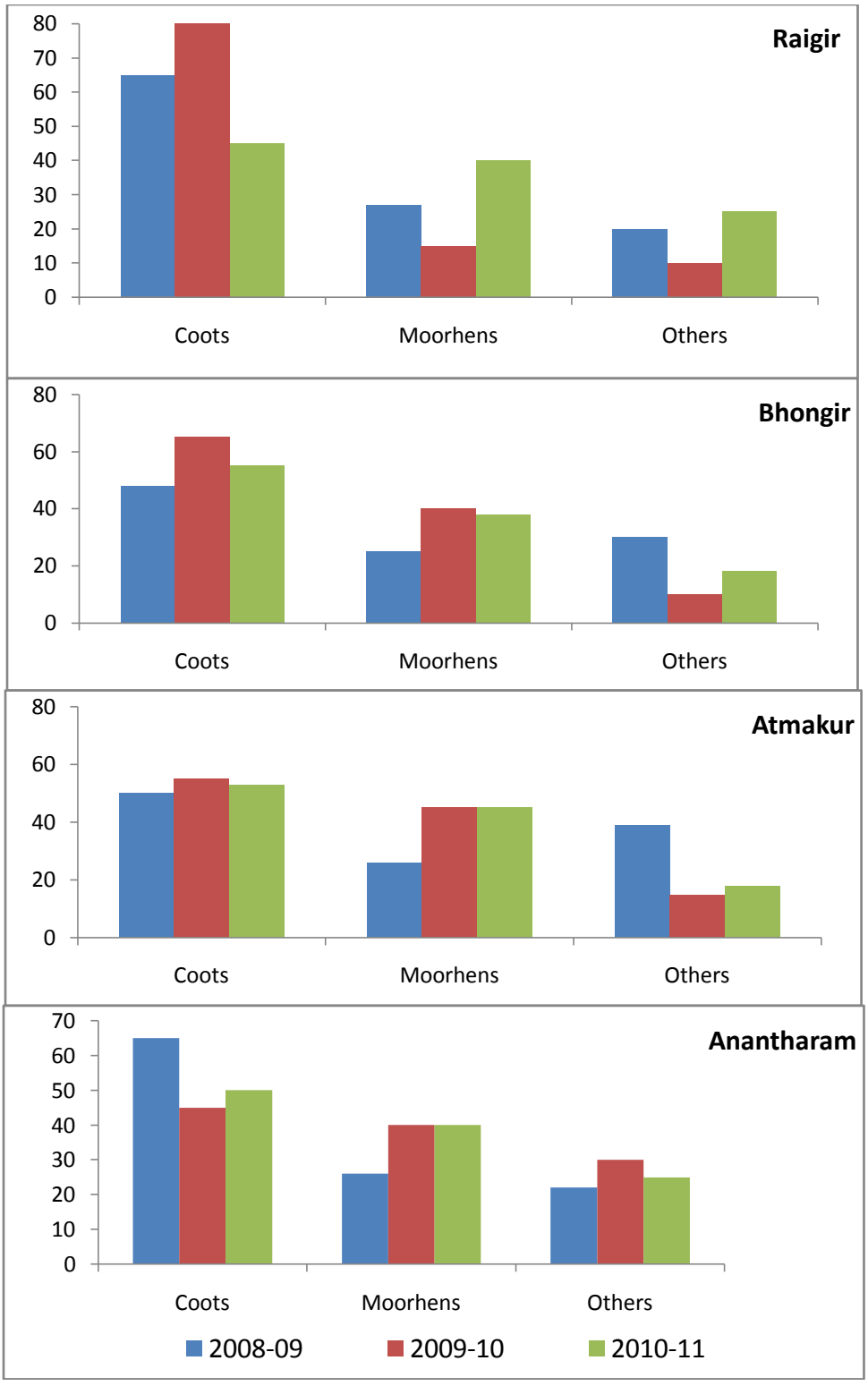



Fig. 3: Percent composition of coots, moorhens and others in non -perennial tanks during the study period

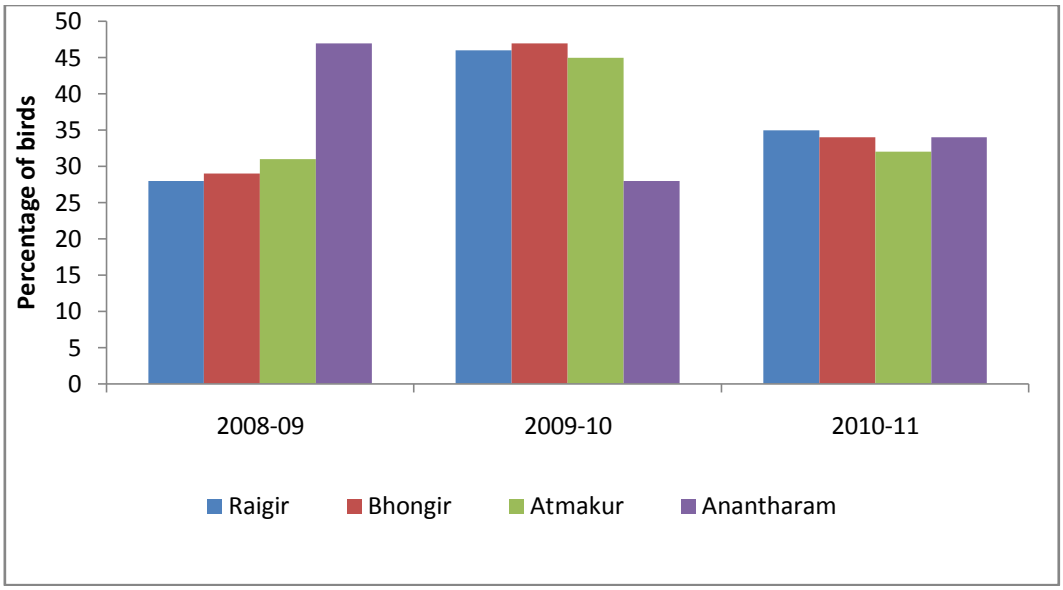



**Fig . 4:**Percent composition of Charadriidae family in perennial tanks during the study period

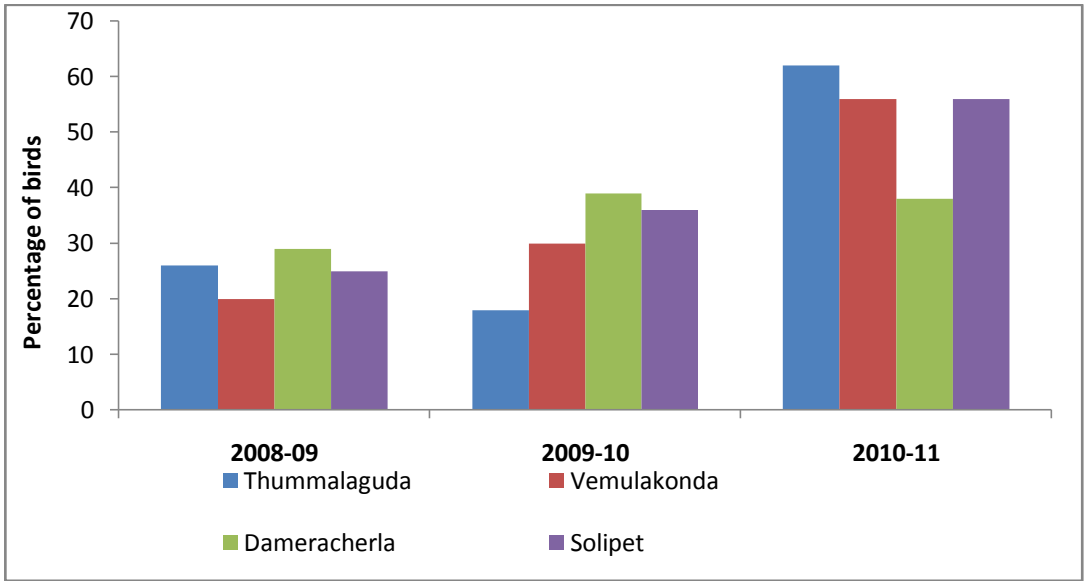



**Fig.5**: Percent composition of Charardriidae family in non-perennial tanks during the study period

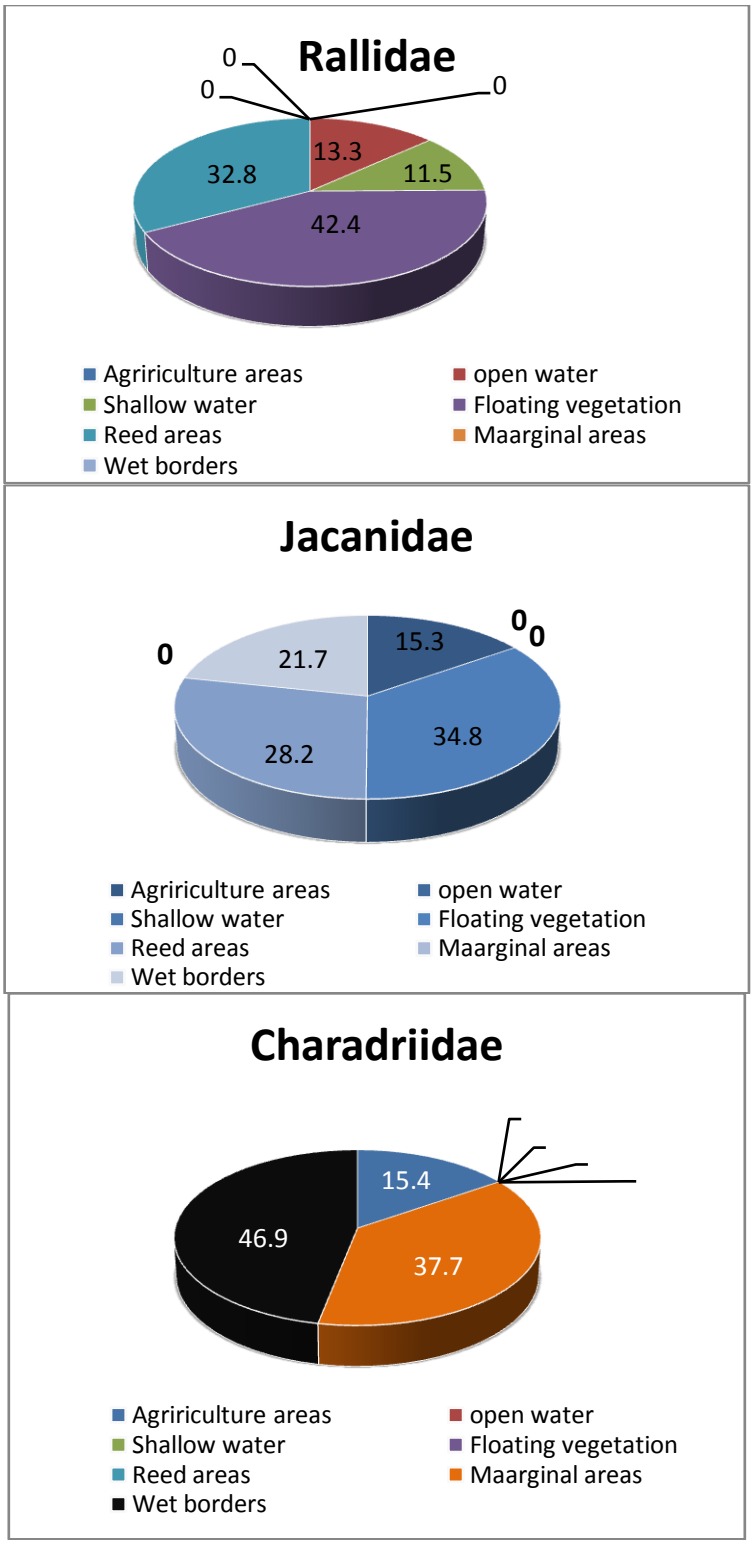



Fig. 6: Habitat use of Rallidae, Jacanidae and Charadriidae in perennial tanks during the study period

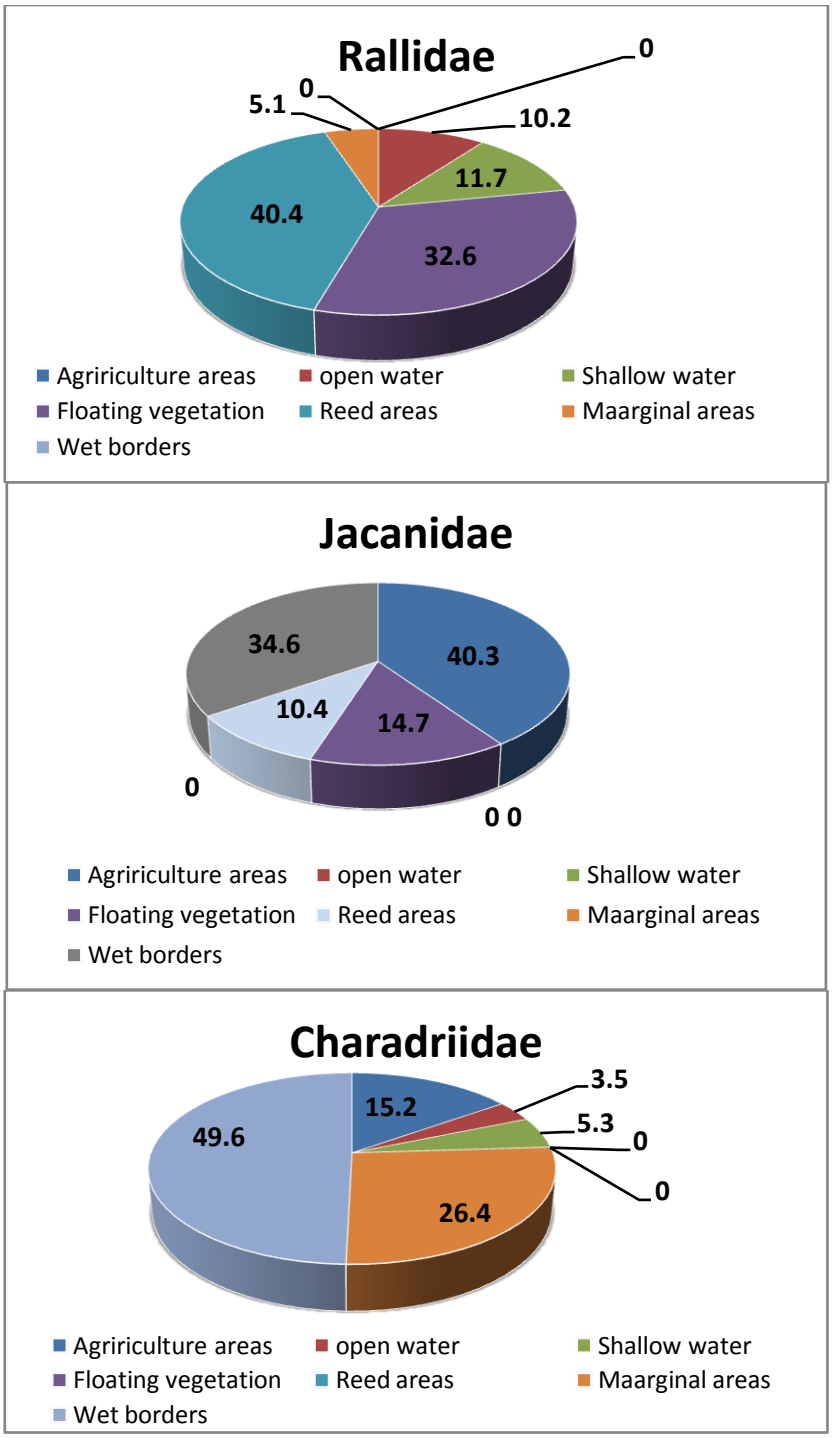



Fig. 7: Percent of Habitat use byRallidae, Jacanidae and Charadriidae in non-perennial tanks during the study period

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