International Research Journal of Biological Sciences _____ ISSN 2278-3202
Vol. **7(3),** 41-45, March **(2018)** *Int. Res. J. Biological Sci.*

Short Communication

Habitat selection and behaviour of purple moorhen (*Porphyrio porphyrio*) in district Ambala, Haryana, India

Sarita Rana
Deptt. of Zoology, University College, Kurukshetra University, Kurukshetra, Haryana, India
saritarana20@kuk.ac.in

Available online at: www.isca.in, www.isca.me
Received 18th December 2017, revised 28th February 2018, accepted 8th March 2018

Abstract

Purple moorhen (Porphyrio porphyrio) is a purple color bird of order Gruiformes and Ralidae family. It is found inhabiting marshy lands, swamps and often found foraging in paddy fields. Purple moorhen usually prefers wetlands for various activities like feeding, foraging and nesting, but due to increased encroachment of these wetlands large scale change in habitat selection and behavior has been observed since last decade. The study was conducted in the district Ambala of Haryana from May 2015 to October 2016. As the breeding season commences aquatic plant species Salvinia was found to be abundant in the water bodies and so it is most preferred species for nesting by the purple moorhen. Maximum time was allocated to the activities like foraging feeding, care of chicks and resting. For most of the activities of the day preferred microhabitat was Salvinia and Eichornia.

Keywords: Habitat, selection, purple moorhen, Porphyrio porphyrio.

Introduction

Purple moorhen (*Porphyrio)* is a large purple color bird which possess long red legs and a red frontal shield belongs to Order *Gruiformes* and family *Ralidae*. It inhabits marshy lands and swamps. It is shiny purple with red patch on the head and also possess red beak with long legs found moving along the shore edge or among the reed beds. The male is a glistening purple color and the female is a little duller with greyish-purple color. The *Porphyrio* prefers areas with heavy rainfall, swamps, lake and damp areas. This birds prefers to live in pairs or in large groups. *Porphyrio* hoppers through the reeds, and prefers to forage among reed beds and vegetation matter. Food matter of *Porphyrio* comprises of ducklings, small fish, invertebrates and vegetation matter.

Purple moorhen is a seasonal breeders, which breeds during the peak rainfall in many places such as warm reed beds. Social behavior found in purple moorhen is monogamous. Breeding pairs tend to nest in a large areas of interwoven reed flats on floating reeds present over the water. Female *Porphyrio* lays 3–6 speckled eggs which are pale yellowish to reddish in color having spots of reddish brown color. The incubation period is of 23–27 days, and incubation duties are performed by both the sexes.

After 23-27 days precocious chicks with downy black feathers emerge out from eggs which are capable of leaving nest soon after they hatch out from eggs. But chicks tend to remain in the nest for a few days along with the adults. Precocial chicks are fed by their parents for the period of 10–14 days till the chicks learn to feed themselves. Chicks of purple moorhens tend to remain along with their parents for the period of two years until they acquire sexual maturity.

The behavior pattern of the species is influenced by the availability and dynamics of the habitat of the species. Species may shift to another habitat depending upon the availability and threats species has to face in the present habitat. Increased encroachment of wetlands had reduced foraging and nesting grounds of Purple Moorhen as a result species is forced to shift it habitat patterns from one aquatic habitat to another. In relation to change in habitat preference behavior of the species in turn is greatly influenced. In this study the changing habitat patterns and behavior of Purple Moorhen was studied in the present scenario.

Materials and methods

The study was conducted in the district Ambala of Haryana from May 2015 to October 2016. The study period coincides with the breeding season of purple moorhen. The number of birds found in the microhabitat were assessed by censing the birds in each habitat in different months and seasons. Multivariate analysis was used to compare the mean population of Purple moorhen which was found in open water, floating vegetation, emergent vegetation and emergent floating vegetation. Floating vegetation mainly consists of *Salvinia* and *Azolla*. The prominent emergent vegetation includes *Oryza* and *Sacciolepis*. The rooted floating vegetation mainly consists of *Nymphaea stellata* and *Utricularia*. The emergent floating vegetation harbours both emergent and floating plants. In this

study habitat characteristics were studied in breeding and non-breeding sites. Also behavior of purple moorhen was studied using time budgets. Direct focal observation method was adopted to study the behavior and activities of Purple moorhen. The birds were observed with the binoculars. Various activities of the birds such as awakening, roosting, calls, movements, maintenance and agonistic behavior, postures and displays were also noted.

Results and discussion

Habitat**:** Habitat selection by the moorhen was studied in four different seasons i.e winter, autumn, summer and spring. The availability and habitat usage was found to be different in seasons. Availability of *Eichornia* (90%) was found to be high in winter and autumn so Purple Moorhen used (75%) this plant species exclusively for the activities like foraging, resting and feeding. In summer season *Oryza* was found to be dominant species so the Purple Moorhen used it for foraging and feeding purposes. As the breeding season commences aquatic plant species *Salvinia* was found to be abundant in the water bodies and so it is most preferred species for nesting by the purple moorhen. It is clearly marked in Figure-1 that availability and abundance of plant species influences the habitat selection and behavior of Purple Moorhen in different seasons (Figure-2-5). *Eichornia* is preferably used microhabitat as it provides appropriate concealment to eggs and chicks in early stages of nesting and incubation. On the other hand availability of *Oryza* is high but preferred less as it does not provide concealment to eggs and chicks during the breeding season. Salvinia is used for foraging and feeding microhabitat as it harbours many invertebrates which are used as food for purple moorhen.

Behavior patterns: Behavior of purple moorhen was studied under six different categories i.e. Locomotion, grooming, Intra-specific Behavior, Inter-specific behavior, Foraging and Resting. Different type of behavior of Purple Moorhen was studies under these six behavioral categories in context to habitat and time budgets as shown in Table-1.

Maximum time spent was allocated to the activities like foraging foraging, care of youngones and resting. 7-8 hrs were spent during foraging, whereas 6-7 hrs of the day were spent in care of young ones. 3-4 hrs of the day were spent on resting for which preferred microhabitat was S*alvinia* and *Eichornia*. Purple Moorhen undergoes various types of locomotion depending upon habitat and threat actors like flying, swimming, walking and jumping. Most and least preferred type of locomotion is walking and flying respectively. Purple Moorhen prefers flying only during attach and escape situations and time duration for this is 0.3 sec. Time duration spend upon care of young ones and foraging is high as it increases chances of adult and chick survival. Purple Moorhen prefers grooming activities like bathing, shaking and preening on the sunny days but the time duration for each activity was found to be significantly low.

Preferred plant species for foraging activity was *Eichornia* and white lily (*Nymphaea)* as it provides ample supply of food resources.

Eichornia as shown in the most preferred microhabitat for activities like feeding, foraging, resting and for offence. Single foraging periods last for 15-20 min whereas time duration allocated upon resting is 20-25 min. Open water bodies are preferred for activities like bathing and swimming. Depending upon the presence and absence of predators sort duration defense activities like attack and escape are carried out by the Purple Moorhen.

Attack and escape activities increase the chance of protection of adults as well as predators. During breeding season most of the time duration occurs in courtship behavior in *Oryza* it increases the chances of sexual selection. For nesting and care of young ones mostly preferred microhabitat is *Salvinia* and *Eichornia*.

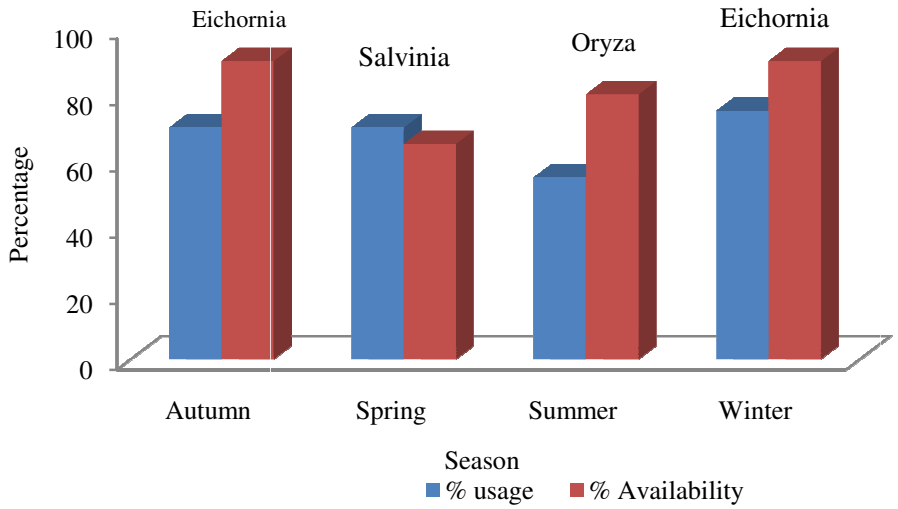

Figure-1: Seasonal usage and availability of different microhabitat by Purple Moorhen.

Table-1: Behavior patterns of Purple Moorhen.

Behaviour	Activity	Hours of the Day Spent	Duration of activity	Significance of activity	Micro-habitat Used
Locomotion	Walking	2--3	1-4min	Foraging	*Nymphaea*
	Jumping	1-2	0.5 sec	Escape	*Utricularia*
	Flying	1/2-1	0.4 sec	Escape	*Eichornia*
	Swimming	1-2	4.6 min	Foraging/thermoregulation	Open water
Grooming	Bathing	1-2	2-3 min.	Thermoregulation	Open water
	Shaking	½	0.5 sec	Parasite removal	*Oryza*
	Preening	½	1-2 min	Oiling feathers	*Oryza*
Intra-specific behaviour	Attack	1-2	0.5 sec	Defense/offence	*Salvinia*
	Escape	2-3	0.8 sec	Defense/offence	*Salvinia*
	Care of off springs	6-7	10-15 min	Paternal defense	*Eichornia*
	Courtship	2-3	10-12 min	Sexual selection	*Oryza*
Inter-specific behaviour	Attack	1-2	0.6 sec	Defense/Offence	*Eichornia*
	Escape	1-2	0.5 sec	Avoiding predators	*Nymphaea*
Foraging		7-10	15-20 min	Feeding	*Salvinia/Azolla*
Resting		3-4	20-25 min.	Energy conservation	*Eichornia*

Discussion: Habitat: The term habitat has been used to relate birds to various aspects of the environment. Microhabitat of an organism is its physical and biological factors at finest scale. Changes in the microhabitat can critically influence the survival of an organism. The macrohabitat of the bird is habitat at large scale like open water, floating vegetation, emergent vegetation and emergent floating vegetation which were variously utilized by the bird[1].

The abundance of the birds in the microhabitats differs in months and seasons mainly depending on availability of vegetation, water and the presence of predators. Purple Moorhen was seen in floating vegetation, emergent and emergent floating vegetation in winter and also in early summer due to the extensive cover of vegetation in this season.

In the monsoon large number of Moorhen spent most of the time in open water throughout the particularly in August and September. In the summer and winter as there was no extensive open water bodies available for the bird force to shift its habitat from *Eichornia* to *Oryza*. Sites are presumably selected to optimize an individual's net energy gain while avoiding predators[2]. After the monsoon the water gradually receded from the habitat so the birds had to depend on vegetation for breeding and feeding. The floating vegetation mainly composed of *Salvinia molesta*[3].

The least number of birds were seen in emergent vegetation and emergent floating vegetation in monsoon because the birds used this vegetation for breeding in monsoon. Purple moorhen so preferred vegetation zones in winter and summer. The availability and requirement of food and water and feeling of safety would be the major factors which influenced the habitat preference of the birds in the various seasons.

Nest concealment, or visibility, is a common adaptation for reducing the risk of nest predation. Tall, dense vegetation may confer protection by creating visual barriers, as does increasing the number of available nesting sites and hindering the movement of avian.

The habitat of moorhen could be divided into two main zones i.e the central core zone characterised by abundant vegetation, high water level and difficult accessibility and the peripheral buffer zone is characterised by sparse vegetation, low water level and easy accessibility. The birds were observed remaining flocked in core zone some time after awakening, in the early morning. The birds gradually started moving from core zone to the buffer

zone for feeding when sufficient sunlight fell in the habitat. In the late morning Moorhen were seen in the buffer zone which provided ample food. Then the Purple Moorhen scattered well in the buffer zone for feeding, however in the late evening were seen returning from buffer zone to the core zone and as soon as the sun was set all the birds moved to their roosting site in the core zone.

Behaviour pattern: Behaviour is also believed to be consisting of various expressions of a bird in response to the internal stimuli mainly related to the physiological needs. Birds visual signals are communicated by the movements of the head, body, tail, wings and body feathers[4]. Calls are vocal displays of birds whereas body postures are visual displays. The intrinsic stimuli are closely related to the physiology of the birds whereas the extrinsic stimuli depend on the biotic and abiotic factors of the habitat[5].

The bird is usually reluctant to fly but preferred to run and walk over the floating vegetation. Purple Moorhen usually skulked about in the vegetation mainly over the Salvinia mat and Nymphaea leaves in search of food. Most preferred locomotion of Purple moorhen is steady steps over the vegetation. The neck and head moved forward and backward while walking. Purple moorhen could run fast over the floating vegetation. It chased the intraspecific and interspecific intruders by running swiftly over the aquatic vegetation[6].

The bird first dipped its head and then neck and shoulder in a scooping motion. The dips were followed by the flapping of wings and ruffling of feathers which helped to spread water over the plumages of its back. The bath was often followed by running by shaking its head and flapping its wings. Purple moorhen mainly uses *Salvinia* mat or *Nymphaea* leaves preening was followed by nibbling the wing feathers and then the breast and flank plumages. The preening was performed slowly and carefully and while preening the bird ruffled its feathers.

The Purple moorhen is seen chasing an intruder to drive it away from its territory. If the intruder was a con-specific most probably a fight would take place when the trespasser turned back to the chaser. Then they leaped in air with the flapping wings. In mid air both the rivals pecked and kicked at each other. Purple moorhen chased not only a conspecific intruder but also an alien species[7]. The chasing continued till the intruder was driven away from the territory. While chasing the bird made sharp threatening calls. Usually the intruder would be an associatory species like Herons, Egrets, Waterhen and Jacanas. During a threat of predator many Purple moorhen gathered in a spot in the habitat for defense or offence. The flock comprised not only the adults but also sub adults mainly found foraging during the breeding season[8]. Purple moorhen showed social defense or offence not only against the avian predators but also against the non avian predators like Jackal, mongoose, rat snake and monitor lizard.

Figure-2: Locomotion: Walking (Microhabitat: *Oryza*).

Figure-3: Offensive Behaviour (Microhabitat: *Oryza*).

Figure-4: Nesting (Microhabitat: *Eichornia*)**.**

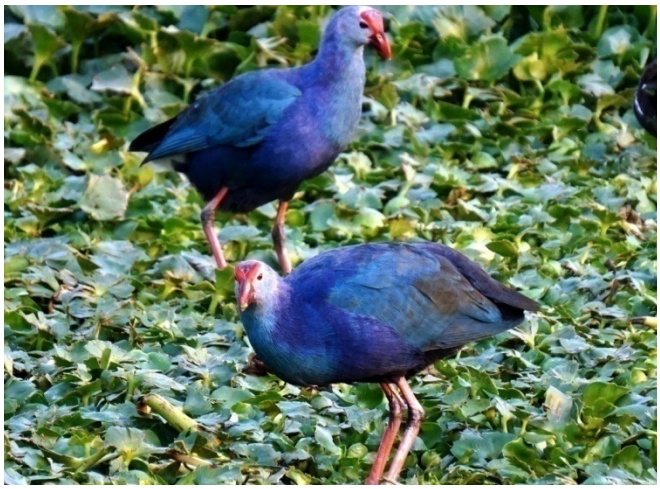

Figure-5: Foraging Behavior (Microhabitat: *Eichornia*).

Conclusion

Eichornia is preferably used microhabitat as it provides appropriate concealment to eggs and chicks in early stages of nesting and incubation. On the other hand availability of *Oryza* is high but preferred less as it does not provide concealment to eggs and chicks during the breeding season. Salvinia is used for foraging and feeding microhabitat as it harbours many invertebrates which are used as food for purple moorhen. Purple moorhen spent most of the time in activities like foraging foraging, care of chicks and resting. Open water bodies are preferred for activities like bathing and swimming. Depending upon the presence and absence of predators sort duration defense activities like attack and escapes are carried out by the Purple Moorhen.

Acknowledgements

I am thankful to staff of City park, Ambala city, Haryana for their cooperation during the field work. I thank Department of Zoology, University College, Kurukshetra University for providing me with all field equipment during my work.

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