SPECIES DIVERSITY AND CONSERVATION MANAGEMENT OF BOBWHITE QUAIL *COLINUS VIRGINIANUS* (LINN.) FROM CHAMBAL REGION OF NORTH MADHYA PRADESH, INDIA

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ABSTRACT

The present investigation was carried out on bobwhites quail of Chambal regions of North Madhya Pradesh. Three districts were covered two district i.e., Bhind and Morean were covered under this study represented by Porsa, Ater and Barai region near and around the Chambal River. Bobwhite is a popular species and they inhabit a variety of habitat types throughout most of the India. During investigation seven habitat parameters food, nesting over, brood rearing cover, loafing/winter cover, escape cover, interpretation of habitat components and minimum habitat size were studied at district Bhind at Ater and Barai and district Morena at Porsa. Almost all seven parameters showed as Ater was good habitat/suitable habitat with respect to bobwhite.

Keywords: *Colinus virginianus*, habitat evaluation, Conservation of bobwhite, Quail, diversity studies, Chambal region.

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INTRODUCTION

The northern bobwhite *Colinus virginianus*, commonly referred to as bobwhite quail, has long been a favorite food bird throughout the India, and is a welcomed upland ground dweller on farms and rural landscapes with its infamous call of "bobwhite" or "bater". Conservation efforts for Bobwhites and other species inhabiting early succession habitats are primarily geared towards development and management of suitable habitat. Although this is not a direct index of population productivity, it does suggest that management of longleaf forests with prescribed fire does not negatively influence an important aspect of Bobwhite productivity.

The meat of quail is considered as delicacy and meat make different recipes pickled meat, tandoori quail and ready to cook meat. Also eggs are used to eat as boiled or make egg pickles. Hence, due to illegal hunting, species of bobwhite declining very faster and degradation of habitats is also a very important further for declining of this species. Looking these facts, the present investigation was made for studies of ecological studies of ravines of Chambal region with respect to bobwhite conservation. It is due to fact that increasing consumer awareness for quality meat, it demanded the production of better quality broiler quail meat. It is of great importance to select the stocks, which have the inherent capacity to yield better quality meat and egg. Male quails usually make a different sound which is usually disturbing to the human. When rearing the male and female quails together the male quails peck the other quails and make them blind (Priti and Shukla, 2014). The bobwhite's popularity has decreased little throughout the Country from last few decades as much as 70 to 90 percent in some areas. Among the most influential impacts reducing northern bobwhite numbers continues due to loss of nesting and protective cover (Myers *et al.,* 2000).

Madhya Pradesh is mostly along the banks of rivers Chambal, Kalishind and their tributaries the terrain through which these rivers pass is hilly and the rain water has to pass through steep slopes thus every year adding to the land under ravines by its corrosive action. Madhya Pradesh, the state occupying the maximum land, harbour a rich flora and fauna. A large number of plants, which are important medicinally or otherwise, occur in this state.

This region is identified by rest of India by its extensive ravines. The ravines created by gully erosion, are heavily under soil loss. The Government of Madhya Pradesh has tried to check this soil erosion and expansion of ravines by the means of watershed development and by aerial-seeding for plants like *Prosopis*, *Acacia* and *Jatropha* in the ravines.

Due to this geographical natural environment there is a good population of quail in these region which has its own unique important to conserve it by using ecology survey studies and taken up the present investigation.

MATERIALS AND METHODS

The good habitat for bobwhite is sandy soil with dried in nature. Therefore, the soil nature of Bhind district and Ater regions favors the habitat of the bobwhite. Therefore, in the present investigation selected Morena, Para and Barai as study sites in Madhya for habitat evaluation and monitoring of bobwhite (Fig. 1).

The present investigation examined the influence of different ecological parameters on the abundance of biota of the areas. The aim of entire statistical analysis is to assess the quantitative relationship between various ecological parameters. Four major vegetation types (forest, scrub-shrub, open herbaceous lands and ravine nature land) were delineated based ecological factors which constituted 91% of t total land cover on our study site.

The bobwhites were observed during winter season and summer seasons at most active period in the day i.e., morning (6.00 am to 10.00 am) and late afternoon (4.30 pm to 7.00 pm). A direct visual count with binoculars (Olympus) was employed and where possible an actual count was taken. Where there were a large number of birds, an estimate (up to the nearest 5-10 individuals) was made. Along with the bobwhite others terrestrial birds sighted in that locality were also noted.

Bobwhites sighted during the study period were categorized according to their status at three locations i.e., Porsa district Morena, Ater and Barai in Bhind district which have been known to breed in the study area itself and encountered during every visit. The identification of species was following Grimmett *et al.* (1999), Ali, and Ripley (2001).

We estimated fall population densities using a fall covey survey. We counted the number of coveys giving the early in the morning before leaving roost locations (Stoddard, 1931). We systematically placed survey points throughout the study area to maximize coverage and efficiency. The soil and land of the North Madhya Pradesh is sandy with deep valley or ravine areas are also found near/around the rivers of the north Madhya Pradesh. The good habitats for bobwhite are sandy soil with dried in nature. Therefore, the soil nature of Bhind district and Ater regions favors the habitat of the bobwhite.

RESULTS AND DISCUSSION

Various factors interacting with others in an ecosystem involve all the abiotic and biotic elements. Each and every individual has its own environmental requirements according to their mode of nutrition, age and climatic conditions in which they can survive easily (Prasad et al., 2006).

We began our research by describing the vegetative characteristics of selected roost sites at Ater in district Bhind in North, Madhya Pradesh. Majority of the habitat selected is closely associated with Chambal River (knows as major ravines in India) and identifying vegetative attributes that might distinguish these areas from randomly available sites

(Fig. 8). We wanted to know, that the quill refers it's sandly habitat or vegetative habitat means quail did a good job of selecting a protective roost site, or if it simply stopped in its tracks. Field borders may be used to create, supplement, or enhance early-succession habitat on private agricultural lands (Dimmick *et al.,* 2002; Smith *et al.,* 2005).

During investigation of research work, total seven habitat parameters food, nesting over, brood rearing cover, loafing/winter cover, escape cover, interpretation of habitat components and minimum habitat size were studied at district Bhind at Ater and Barai and district Morena at Porsa (Table 1). During survey almost all seven parameters showed as Ater was good habitat/suitable habitat with respect to bobwhite. Similar type of findings was obtained by Smith *et al.* (2005) as he studied agricultural field suitability for bobwhite.

Nesting sites for adults and childs of bobwhites were studied during 2013, 2014 and 2014 at points representing all three sampling sites of ravines of Chambal division of Madhya Pradesh. During 2013 studied point one (P1 and P2) was about 2.0km away from village Jamsara of district Bhind where high number of ravines are found because two rivers Kunwari and Chambal are flowing towards east of this study site. Total 15 nests were observed of which 20 adult's bobwhite were seen. However, 10 child bobwhites were seen at same location (Table 2). Studied point two (RF-43) was fixed near Barai village which was about 0.5km away from Barai village where total 20 nesting sites were recorded. Total 25 adults and 12 childs were seen at RF-43 location (Table 2). Similarly, studied point three (R-38) was fixed near village Para of district Bhind which was about 1.0km away from this village Para. Total 25 nesting sites were seen which were represented by 28 adults and 14 child bobwhite specimens/individuals. All three locations studied during 2013 shows that, nesting site three R-38 showed high number of nesting sites as 25 nests, adults as 28 adults and 14 childs bobwhites were seen during investigation (Table 2).

In the same way, during 2014 same nesting sites were repeated for confirmatory studies for nesting, adults and childs observations. Nesting site P1 and P2 which is 2.0km away from Jamsara is represented by 12 nests, 15 adults and 8 childs bobwhite during 2014 which is slightly different in numbers when it compared with the data of 2013 studied in the same parameters. Sampling site two RF-43 which is fixed at 0.5 away from Barai village showed 14 nests, 15 adults and 06 child/chicks during 2014. On the other hand, at studied point three (R-38) which is fixed about 1.0km away from village Para represented 19 nests, 10 adults and 08 chicks at this survey during 2014 (Table 3). Studies of 2014 shows that studied site three was good as much as concern to high nesting sites observed as 21, good number of adults as 25 and chicks as 12 as compared to other two sites. However, lesser number of nest, adults and as 12, 15 and 8 respectively were observed at site P1 and P2 at Jamsara village.

During 2015 of the investigation, at P1 and P2 10 nest, 12 adults and 04 childs/chicks of bobwhite were observed at village Jamsara of district Bhind (Table 4). Site RF-43 was represented by 14 nests, 15 adults and 06 chicks and studies site-3 R-38 was represented by village Para as 19 nests, 10 adults and 08 chicks/ adults (Table 4 and Fig. 4). It comes across the studies on nesting, adults and chicks of bobwhites surveyed during 2013-2015, high number of nests, adults and chicks was recorded in 2013 at studied site R-38 which was fixed at Para village.

In the past, these nonproductive areas also provided proper nesting cover around crop fields and created a suitable environment for a wide variety of insects. Insects provide high protein food important to adults and young birds during the nesting season. In addition, these zones grow many native quail food plants which provided seed during the winter months. Our results suggest that the population of bobwhite quail in the North Madhya Pradesh India has crossed the extinction threshold or will in the near future. We expect extinction soon after, but due to bifurcation delay, there will be an unknown amount of time between when the threshold is crossed and when extinction occurs (Kuehn, 2011).

Results of this study indicate that ecological and demographic parameters for bobwhite in ravines of Chambal region to be similar to those reported elsewhere in the India. These data indicate that bobwhite declines in Chambal region. Brood survival or survival at other times of the year could still be limiting bobwhite populations. The similarity of nest success rates only implies that a ravine does not represent a special case in bobwhite biology. Beyond the establishment of a survival cost for increased mobility in Bobwhites, it is also of interest to understand whether this cost is caused by unfamiliarity with surroundings or increased activity that may attract predators. Yoder *et al.* (2004) demonstrated that survival cost for increased mobility in Ruffed Grouse (*Bonasa umbellus*) was attributable more to reduced site familiarity in mobile individuals than attraction of predators.

This is provided by insects that can easily be found in low-growing herbaceous vegetation, preferably where there is bare ground for easy movement of chicks and a plant canopy to shield the birds from predators (Rosene, 1969, DeVos and Mueller 1993). Arthropods are an important source of essential amino acids and protein for growth, feather development, and maintenance in chicks of most gallinaceous birds (Savory 1989). As such, several studies (Hurst, 1972; Tobler and Lewis, 1980; Burger *et al.,* 1993; Manley *et al.,* 1994) have focused on estimating habitat-specific arthropod abundance as an index to habitat suitability for northern bobwhites.

There is insufficient information about the effects of management practices on roosting habitat or roost site selection by wild bobwhites, and roost site selection by bobwhites has never been examined. However, they documented lower mammalian predation in the non-breeding

season compared to avian predation, which differed from our consistently higher mammalian mortality observations. Rollins and Carroll (2001) suggested that predation is the primary source of bobwhite mortality.

Overall based on climatic conditions, soil profiles/physio-chemical characteristics, bobwhite nesting survey, counting of the individuals as adults and chicks levels, it may conclude that out of all studied sites Ater and Para village is better for survival of the bobwhite (*Colinus virginianus*) as good number of nest, adults and chicks were observed during 2012 to 2015. However, the present investigation compared with other studies carried out by many scientists in India and abroad shows that this bobwhite species declining very faster than other places of India and other countries. For conservation of the northern bobwhite, it is suggested to minimize the excessive use of bobwhite as food, ecological research on habitat is requied. Socio-economic and local communities is needs to aware them towards bobwhite conservation and management of the habitat.

Table 1. Habitat components of Northern Bobwhite (*Colinus virginianus*) evaluated at station-A, station-B and station-C

S. No.	Habitat component	Station-A (Bhind-Ater)	Station-B (Morena-Porsa)	Station-C (Bhind-Barai)	Final Findings
1.	Food	++++	++	++	Excellent food, nesting and other habitat components were observed in station-A i.e. at Bhind district region covering near and around the Ater area. These are showing good ravines and sandy soil. Therefore, it may be a good habitat suitability of bobwhite species
2.	Nesting Cover	++++	+	++	
3.	Brood-Rearing Cover	+++	++	++	
4.	Loafing/Winter cover	++++	+	++	
5.	Escape Cover				
6.	Interspersion of habitat components	++++	++	+++	
7.	Minimum habitat size	+	++	+	

Note:++++= High; +++= Medium; ++= Low; + Absent

Table 2. Nesting sites data for adults and child's observed during 2013 for Northern bobwhite in ravines of Chambal region, Madhya Pradesh

S. No.	Study site Name/Nesting Sites	Total number of nests observed	Total number of adults bobwhites observed	Total number of child bobwhite observed
1.	**P1, P2** (2.0km away from Jamsara Village)	15	20	10
2.	**RF-43** (0.5km away from Barahi Village)	20	25	12
3.	**R-38** (1.0km away from Para Village)	25	28	14

Table 3. Nesting sites data for adults and child's observed during 2014 for Northern bobwhite in ravines of Chambal region, Madhya Pradesh

S. No.	Study site Name/Nesting Sites	Total number of nests observed	Total number of adults bobwhites observed	Total number of child bobwhite observed
1.	**P1, P2** (2.0km away from Jamsara Village)	12	15	8
2.	**RF-43** (0.5km away from Barahi Village)	18	20	9
3.	**R-38** (1.0km away from Para Village)	21	25	12

Table 4. Nesting sites data for adults and child's observed during 2015 for Northern bobwhite in ravines of Chambal region, Madhya Pradesh

S. No.	Study site Name/Nesting Sites	Total number of nests observed	Total number of adults bobwhites observed	Total number of child bobwhite observed
1.	**P1, P2** (2.0km away from Jamsara Village)	10	12	04
2.	**RF-43** (0.5km away from Barahi Village)	14	15	06
3.	**R-38** (1.0km away from Para Village)	19	10	08

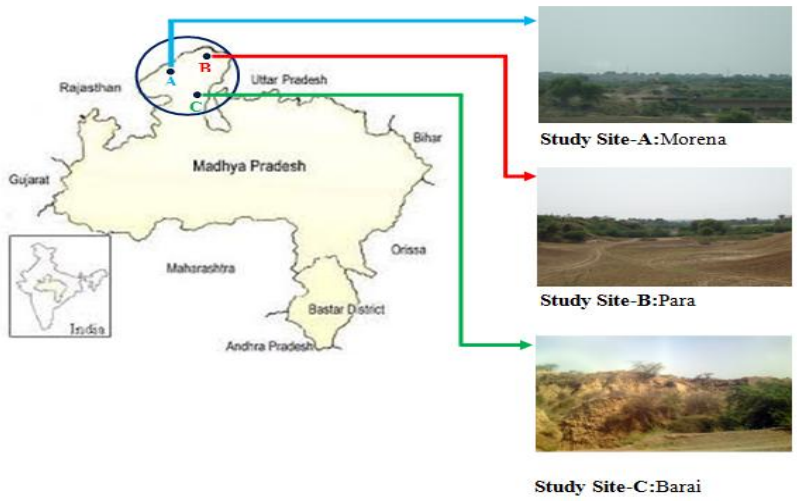


Fig. 1. Sampling sites chosen for ecological studies of bob white quail (*Colinusvirginianus*, Linn., 1758) of Chambal region, Madhya Pradesh

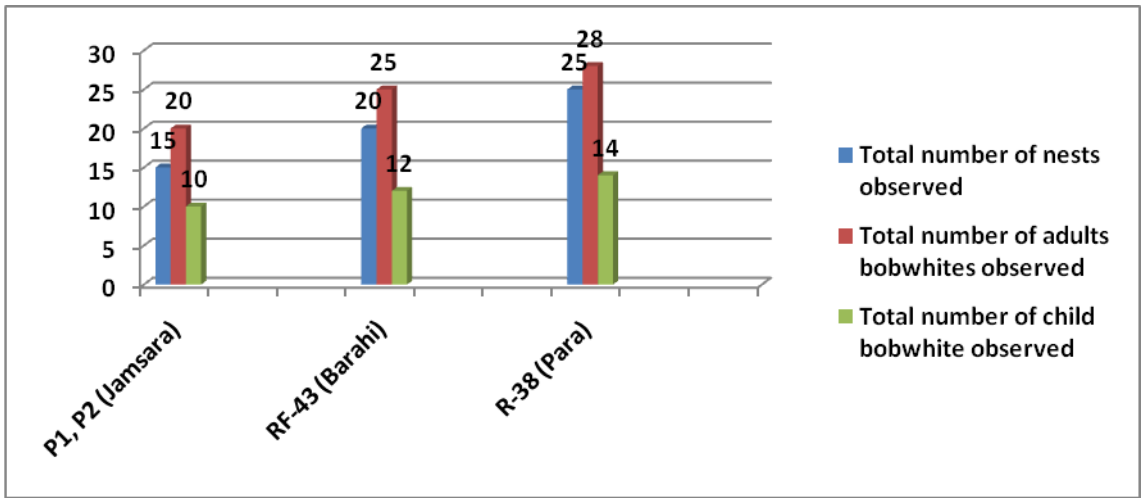
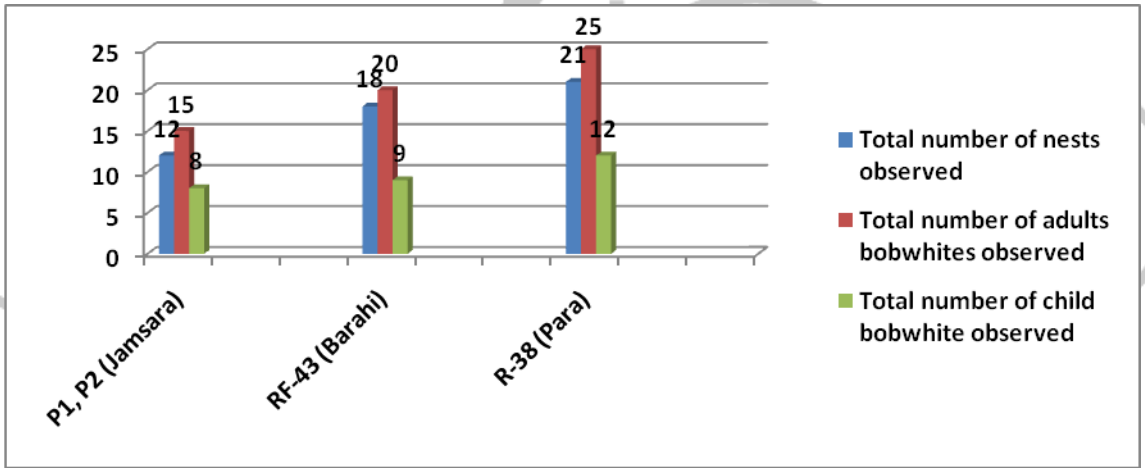


Fig. 2. Graphical representation of Nesting for adults and child's observed during 2013 for Northern bobwhite in ravines of Chambal region, Madhya Pradesh



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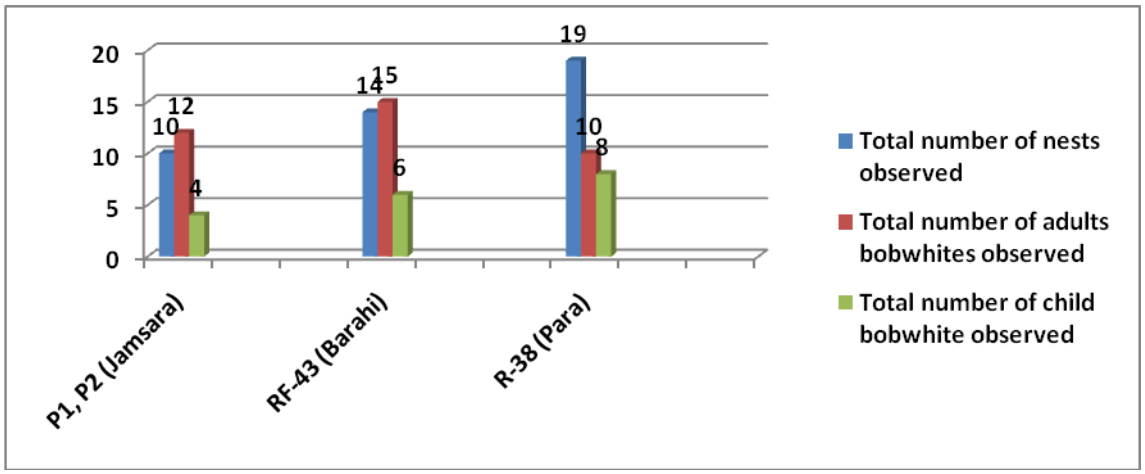

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