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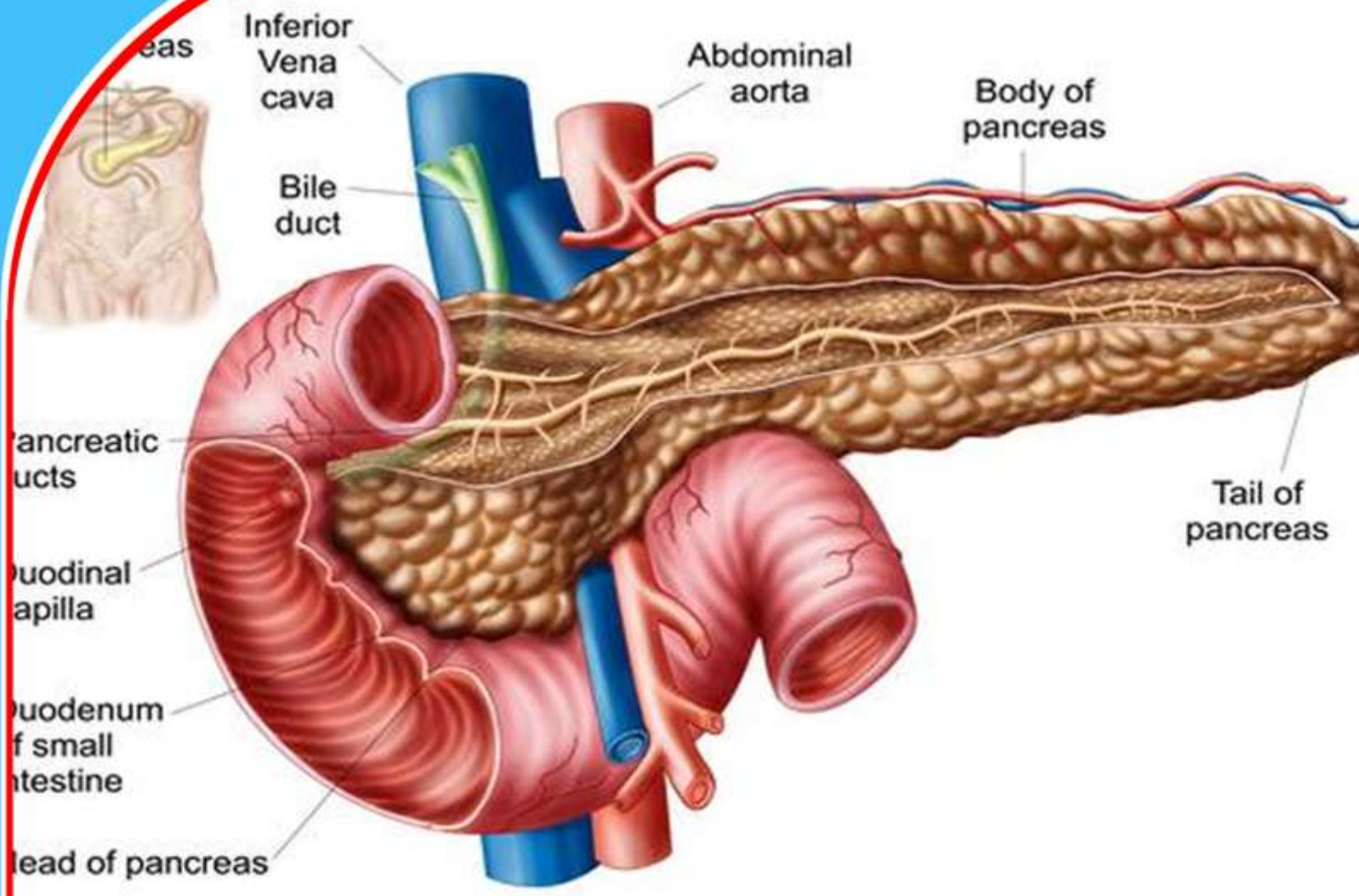

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ABSTRACT

Purpose: The ex-situ conservation aims to discover new populations or supports the populations that yet survive in the wild. To breed animals in captivity and release them in their natural control habitats is one of the conservation methods. Amongst other species partridges also breed in captivity and can be release in the wild but presently data lacking, need to examine. Chukar partridge, Black francolin and Grey francolin are used for sports hunting in Pakistan. The available record on captive breeding of Chukar partridge, Black francolin and Grey francilin and their release in the wild for the years 2015-2020 was reviewed using a developed questionnaire.

Methodology: Review record of Khyber Pakhtunkhwa Wildlife Department Pakistan through a developed questionnaire

Findings: It was found that the maximum number of chukar partridge breed was 36, Black francolin (6) and Grey francolin (24). Out of the breeding stock, Chukar partridges (44) and Grey francolin (28) were released in the wild to its natural habitat by hard release technique.

Unique contribution to the theory, practice and policy: The researchers recommended decrease in dissimilarity of habitat quality between breeding center environment and the release habitat besides providing a pre-release training to the release experts so as to improve habitat selection and survival of captive-bred. This study will help researchers for further in depth study in the area and will also facilitate conservation organization in making captive breeding of partridges as a successful program.

Key words: *Partridges, Captive breeding, Dir Lower, Khyber Pakhtunkhwa, Pakistan*

INTRODUCTION

Black francolin belongs to the Kingdom Animalia; Phylum Chordata; Class Aves; Order Galliformes; Family Phasianidae; Species *Francolinus francolinus*; Common Name is Black francolin. In Pakistan it occurs in vegetation of shrubby type, grassy brush lands, and grass lands. It is not a forest or deserts occupant. It occurs from sea level to 750 m, on uniform, undulating mountainous landscape. The breeding season starts from March or April finish in October depending on the weather conditions. They nest in a minor dip under grass clumps lay 6-8 eggs, almost oval (Roberts, 1991).

Grey francolin belongs to the Kingdom Animalia; Phylum Chordata; Class Aves; Order Galliformes; Family Phasianidae; Species *Francolinus pondicerianus*; Common name Grey francolin**.** It occupies the widest range of dry habitats, avoid treeless deserts, marshy terrains, thick forests, sharp ground and moist tracts. It is found from sea level up to 600 meters, infrequently to 1400 meters. (Roberts, 1991). They breed through the year with the rains in the western and before and after the monsoon in the rest of its range. It nests in a low pit in grasslands, open scrub hedges, and growing crops. It lays 6-9 eggs (Roberts, 1991).

Chukar partridge belongs to the Kingdom animalia; Phylum chordata; Class aves; Order galliformes; Family phasianidae; Species A*lectoris chukar*; Common name chukar partridge. The nesting season starts from April and last till June or even delayed. The nest is merely an unfilled rubbed in the ground beneath take refuge of a bush or rock, or at the base of a grass, on rough hillsides. The usual clutch ranged between 7-12 eggs but 13 to 20 eggs have also found in a solitary nest. The broods average is mostly 10.5 chicks, the young reach adult size in 12 weeks. (del hoyo et al., 1994). The aim of ex-situ conservation is to discover new populations or support the populations that yet survive in the wild (Frankham et al., 2004; Witzenberger and Hochkirch, 2011). One of the main concerns of managers is to produce as much offspring as possible (Frankham, 2010).

Wildlife conservation is carried out through various methods. One method is to breed animals in captivity and release them in their natural control habitats (Buner and Schaub, 2008). Among other species partridges species is one of them to breed in captivity and release in the wild. Chukar partridge Black francolin and Grey francolin are among species used for sports hunting in Pakistan. Major causes for decline of partridges population comprise of habitat degradation, use of pesticides, weak managed hunting, human settlements, habitats conversion agricultural lands (Khan, 1999).

Captive breeding of Black francolin, Grey francolin and Chukar partridge is data lacking. Therefore, the present study was conducted to examine captive breeding of Black francolin, Grey francolin and Chukar partridge in district Dir lower, Khyber Pakhtunkhwa, Pakistan for the last six years (2015-2020). This study will help researchers for further in depth study in the area and will also facilitate conservation organization in making captive breeding of partridges as a successful program.

STUDY AREA

The study area is a partridges breeding center covering an area of 40,000 square feet, 400 feet long, 100 feet wide with height 10 feet and located at GPS coordinates N 34º 50'53.71" and E 71º 48'14.3" in District Dir Lower, Khyber Pakhtunkhwa, Pakistan.

METHODS

The researchers examined record on captive breeding of Black francolin, Grey francolin and Chukar partridge in district Dir lower, Khyber Pakhtunkhwa, Pakistan over six years (2015-2020) using a developed questionnaire (Moser & Kalton, 1971; Shackleton, 2001) during June to September 2020. A total of 5 respondents among officers/officials from office of the Deputy Conservator Wildlife Dir Wildlife Division include Deputy Conservator Wildlife (1), Sub Divisional Wildlife Officer (1), office assistant (1) wildlife watcher (1), attendant (1) responded to the questions. (Annexure-1). Questionnaire was conveyed to the respondents through their emails and attained the required.

RESULTS

Breeding

The findings in table-1 reveal that 2017 was the dominant year for chukar partridge breeding with 36 breeds followed by 2020 with 35 and 2019 with 32. The dominant year for Black partridge was 2019 and 2020 with equal number of 6 breeds each year followed by 2016 with 2 while 2017 was the dominant year for Grey partridge breeding with 28 breed, the 2nd dominant year for Grey francolin was 2020 with 24 breed and the 3rd dominant year was 2019 with 20 chicks.

Table-1: Breeding of Chukar partridge, Black francolin and Grey francolin in Breeding center, District Dir Lower, during 2015-2020

Year	Chukar Partridge	Black Partridge	Grey Partridge
2015	15	5	2
2016	-	2	6
2017	36	1	28
2018	13	1	6
2019	32	6	20
2020	35	6	24

Release in the wild/shifted

Table-2 reveals that over six years (2015-2020) partridges were released twice in the wild and once shifted to another partridges breeding center for breeding purpose. The number of partridges released in the wild includes 36 chukar partridge and 28 Grey partridge during 2017 while another release in the wild include 8 chukar partridge during 2018. During 2020 Chukar partridge (23) were shifted to a newly established partridges breeding center.

Table-2: Release in the wild/shifted of Chukar partridge, Black francolin and Grey francolin from Breeding center, District Dir Lower, during 2015-2020

Year	Release in the wild			Shifted		
	Chukar	Black Partridge	Grey Partridge	Chukar partridge	Black Partridge	Grey Partridge
2015	-	-	-	-	-	-
2016	-	-	-	-	-	-
2017	36	-	28	-	-	-
2018	8	-	-	-	-	-
2019	-	-	-	-	-	-
2020	-	-	-	23	-	-

DISCUSSION

Three species of partridges include Chukar partridge, Black francolin and Grey francolin are used as sports hunting species. They breed in Partridges Breeding Center District Dir Lower. The data was reviewed for 6 years 2015-2020. The maximum number of chukar partridge breed was 36, Black francolin (6) and Grey francolin (24).

Breeding of Chukar partridge and Grey francolin remained more successful than Grey francolin and was higher during 2017. Breeding of Black francolin remained lower than the Chukar partridge and Grey francolin over 6 years but a slight high trend was found during 2015.

Out of breeding stock, 44 Chukar partridges and 28 Grey francolin were released in the wild in its natural habitat using hard release technique (Campbell and Croft 2001) while 23 Chukar partridges were shifted to another partridges breeding center established in district Malakand, Khyber Pakhtunkhwa, Pakistan for breeding purpose.

Reintroduction of species to earlier inhabited habitat has re-established deteriorating bird populations (Rudolph et al., 1992, Sanz and Grajal 1998, Armstrong et al., 1999). Breeding achievement is indispensable for success of reintroduction or failure (Armstronget al. 2002) and familiarizing succeeding releases. Release programs may deliver significant perceptiveness into natural preventive factors and recommend supplementary revival activities (Scott and Carpenter 1987) Bird restorations and introductions are embark on due to a variety of reasons. Some species are precious for the sport they deliver (Holloway 1996).

Game birds reared in captivity when released in the wild face a number of threats. A deficiency of familiarity of species habitat needs remained a major factor directing to the disappointment of reintroductions of individuals caught from the wild and captive-bred (Wolf et al., 1996; Stamps and Swaisgood 2007). Nurtured game birds once released have low rate of survival (Robertson 1988, Milla´n et al., 2002, Milla´n et al., 2003), which are normally poorer than those in the wild (Dowell 1990a, Putaala et al., 2001; Kraus et al., 1987, Leif 1994). Predation is normally the frequent threat (Putaala et al. 2001, Meriggi et al., 2002; Robertson 1988, Brittas et al., 1992, Leif 1994, Millan et al., 2002, Millan et al., 2003). This may be due to a number of causes include keeping big numbers of birds in release pans before release which grab predators resultantly

enhance predation risk for released birds (Robertson 1988, Dowell 1992). Reared birds are easily infected due to easy transmission of diseases among penned birds, or enhance defenselessness to diseases due to greater levels of stress. The utilization of medicine in reared birds may go away birds immunologically susceptible when questioned by pathogens in wild (Dowell 1992). Birds reared in captivity may also have deficiency of the behavioral characters or ability to know or react suitably to the threat of predation (Dowell 1990a, 1992), which may be rightly related to generations in captivity (McPhee 2003). Additionally, birds reared in captivity are frequently fed on excessive protein, diet with low fiber, which become not ready for the diet with greater fiber which is available in wild (Putaala & Hissa 1995, Milla´n et al., 2003). In most circumstances more than one factor possibly enables low rate of survival (Dowell 1992).

It is important to decrease any dissimilarity in habitat quality between breeding center environment and the release habitat (Biggins et al., 1999; Roe et al., 2010). It is also essential to acquaint the release experts with pre-release training so as to improve selection of species habitat and survival of captive-bred. (Liu et al., 2016)

The partridges captive breed support wild population. Sport hunting shows direct and indirect effects on the conservation of wildlife species (Ericsson et al., 2004). Sport hunting support conservation in many ways; include protection of species and habitat, revenue generation (PACEC 2000), community livelihood improvement (Adams & Hulme 2001; Hulme & Murphree 2001). Sport hunting and conservation of wild species remained parts of human culture (Osborn & Osbornova 1998). Consequently, the hunting right of citizens is protected by law (Muth & Jamison 2000; Grandy et al., 2003). Conversely, sport hunting experiences complications include receiving the encouragement forms and ownership of resource correctly, safeguarding real and healthy organizations for management of resource and equitable distribution of benefits (James et al., 1999; MilnerGulland & Mace 1998; Salafsky et al., 2001). Numerous countries also go through from wider difficulties of fraudulence and deprived governance, institutional breakdown, communal and monetary turmoil, which decrease the probability of long lasting success for any conservation or growth activity (Smith 2003).

CONCLUSION

Among other species partridges also breed in captivity resulted in reintroduction to the wild. Chukar partridge, Black francolin and Grey francolin breed in captivity and support the populations that yet survive in the wild.. Chukar partridge, Black francolin and Grey francolin are used for sports hunting in Pakistan. Sport hunting support conservation in many ways; include protection of species, protection of habitat, revenue generation and community livelihood improvement. Game birds reared in captivity face a number of threats after release in the wild. A scarcity of acquaintance of species habitat needs remained a key factor pointing to the failure of reintroductions of individuals caught from the wild and captive-bred. The major threats to captive breed when released in the wild comprise of low rate of survival as compared to those in the wild, predation is normally the frequent threat, easily infection of diseases, enhance defenselessness to diseases, deficiency of the behavioral characters or ability to know or react suitably to the threat of predation and diet with low fiber. It is essential to decrease dissimilarity of habitat quality

between breeding center environment and the release habitat besides providing a pre-release training to the release experts so as to improve habitat selection and survival of captive-bred.

Annexture-1: Questionnaire for the study on 'a test case: captive breeding of Black francolin, Grey francolin and Chukar partridge (2015-2020) in district Dir lower, Khyber Pakhtunkhwa, Pakistan'

S.N	Questions
I.	**Partridges population in the Breeding Center**
i.	Year wise population of Chukar partridge 2015-2020?
ii.	Year wise population of Black francolin 2015-2020?
iii.	Year wise population of Grey francolin 2015-2020?
II.	**Partridges released in the wild**
i.	Provide data regarding release of Chukar partridge in the wild during 2015-2020?
ii.	Provide data regarding release of Black francolin in the wild during 2015-2020?
iii.	Provide data regarding release of Grey francolin in the wild during 2015-2020?
III.	**Partridges shifted to other breeding centers**
i.	Provide detail of chukar partridges shifted to other breeding centers during 2015-2020?
ii.	Provide detail of Black francolin shifted to other breeding centers during 2015-2020?
iii.	Provide detail of Grey francolin shifted to other breeding centers during 2015-2020?

RECOMEDATIONS

1. To achieve better results the Breeding Center should be divided into species wise habitats.
2. It is essential to decrease dissimilarity of habitat quality between breeding center environment and the release habitat.
3. It is crucial to build capacity of the experts who are involved in reintroduction of the captive-bred of partridges.

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