

OBSERVATIONS OF SIX REPRODUCTIVE CYCLES AND FOOD HABITS OF BROWN FISH OWL NESTING AT THE HUMAN HABITAT IN BANGLADESH

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ABSTRACT

Background: Research reports on wild nocturnal bird especially Brown fish owl are very limited not only in Bangladesh but also elsewhere.

Objectives: This paper describes the diet profile and physiology of reproduction of a pair of wild Brown fish owl.

Materials and Methods: A breeding pair of Brown fish owl has been used the abandoned flower planting site on the window sunshade for their reproduction during six breeding cycles from 2013 to 2019. The behavior, food sources, food habits and their physiology of reproduction were observed closely and keenly for six reproductive cycles.

Results: The male owl is usually brought prey by hunting at night and supplied to the female owl and their owlet at the nest but the only unconsumed prey lying on the nest were identified visually during the daytime. The most commonly recorded prey consumed by the habitat lost Brown fish owl include fish, frogs, rats, snake, birds and lizards. Investigation of all the six breeding cycles of this species of owl showed that all the six reproductive cycles were completed during the high cold winter months from end of November to early March. The egg clutch size varied from 1-2 with an average of 1.33 and the female owl alone incubated eggs and the incubation period varied from 37 to 38 days with an average of 37.5 days. The brooding and care of owlets were mainly performed by the female owl but the male owl supplied the food usually at night time. All the six reproductive cycles of the owls were successfully completed with fledged the juvenile owls between 53-63 days with an average of 59.25 days parental care with a total of breeding cycle from 91 to 101 with an average of 96.75 days.

Conclusions: The objectives of the wild and zoo birds are for the conservation, research, education, recreation, ecology and economic benefits. This article would help to encourage development of bird parks, to create awareness of bird life and generate interest in ornithology and to help promote conservation of endangered species of birds by captive breeding.

Keywords: Brown fish owl, Food and food habits, Physiology of reproduction, Egg clutch, Incubation period, Seasonal breeding cycle

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INTRODUCTION

Forests provide habitat including food and shelter for wildlife. Deforestation can lead to reduce available food, shelter and breeding habitat of wildlife that caused migration of wildlife to human habitat for food and breeding which caused an increased human and wildlife conflicts make them vulnerable. Owls are usually nocturnal birds of prey and they are usually roosting in large tall tree during the day time.¹ They are hunting prey at night which includes both invertebrates and vertebrate small mammals and birds. The preference of prey depends on the species of owls, e.g. Scops and Screech owls feed mainly on insects, Barn owls prefer mice, shrews and voles, Eagle owl prey on hares, young foxes and birds up to the size of ducks and game birds and Fish owls are specialized for fishing. However, most owls are opportunistic and capable of being adapted to take whatever prey is available in the area.² Bangladesh has 11.1% forest of which 0.17% lost per year and accordingly 1.1% wildlife extinct and 7.5% are threatened.³ There are 54 Bangladeshi rivers that originate in India have either been diverted or dammed upstream inside India. These caused disruption of natural water flow in these rivers resulted effects on Bangladesh's agriculture, fisheries and human health and well-being.⁴ It appears that the habitat of Brown fish owl in Bangladesh has been disrupted due to deforestation especially large tree and dried of lakes, streams and rivers with non-availability of prey fish.⁵ Moreover, the Brown fish owl breeds in dry winter months when the water level of rivers low with mostly absence of prey fish. This is caused migration of owl to human habitat for food and breeding. The semi-nocturnal and secretive lifestyle of the Brown fish owl has limited the scientists from studying it and so very little information is available regarding its breeding and feeding biology. Published reports on the study of Brown fish owl are very limited in Bangladesh⁶ and even elsewhere.^{7,8} The investigation of prey species and breeding biology of migrated fish owls at human habitat would help to know the availability of prey species and the preference of food habit of Brown fish owls with impact in human habitat. Therefore, this paper describes some new and interesting observations on food spectrum and breeding biology recorded during the six successive breeding cycles of Brown fish owls from end of November 2013 to early March 2019.

MATERIALS AND METHODS

A breeding pair of Brown fish owl has been used the window sunshade at the second floor of my living-room windows as a nest for breeding purposes during the winter months from end of November to early March every year from 2013. The friendly behavior and attitude of the female owl helped to study the breeding biology and food habit of this owl species.

The breeding features were measured as date of egg laying and hatching and fledging juvenile owl. In addition, parental care of owlet with behavior of both the male and female owls was also monitored. The incubation period was calculated from the date of the laying of the egg until the date the egg hatched. The prey species brought to the nest by the male owl to feed the female owl and owlet were identified at the nesting site. The nest was monitored every day at least twice once in the morning and once in the evening throughout the period of incubation of egg up to completion of the fled away the juvenile owl from the nest.

RESULTS

A breeding pair of Brown fish owl was used the sunshade of my living-room in the multistoried building for reproduction of the six successive years from November 2013 to March 2019 (Table 1). The reproductive and food spectrum findings recorded during the six breeding cycles are presented.

Nest and nest site

The nest site was on the sunshade of a living-room at the second floor of a four storied building. It is located at a height of approximately 5.79 meter (19 ft) above the ground level. The sunshade was filled with a soil enclosed by a brick wall (size $0.92 \times 1.83 \times 0.3$ m) which was constructed for flower planting but it remains abandoned without planting due to lack of sunlight at the north side of the building. The sunshade is surrounded by the two big mango trees and a big fish cultured pond, moreover no children in my house, and all these favorable factors helped the owl to select the sunshade for breeding purpose.

Reproductive physiology of owl

Every year, from 2013 a breeding pair of Brown fish owl (**Photo 1 and 2**) has selected the same sunshade as a nest without adding any bedding material on the nest. The female owl was laid only one single egg in each clutch in all the first four observed years (**Photo 3**), whereas the last two breeding years laid two eggs per clutch (**Photo 4**). The reproductive activity of the owl was started with the incubation of egg immediately after it was laid on the nest. The breeding season of the fish owl was usually started from end of November to early December and completed at the early March in each year (Table 1). It was observed that the incubation of egg (**Photo 5**) and brooding of owlet (**Photo 6**) were mainly performed by the female owl and she never detached from the egg during the period of incubation and even during brooding time. Each of the eight eggs of the six breeding cycles was hatched successfully in 37/38 days of incubation (**Table 1**). It appears from the **Table 1** that a total of 97 to 100 days period was required to complete the reproductive activities from incubation of egg to the juvenile owl fledged during the four reproductive cycles.

Food spectrum of owl

Prey food is mainly supplied by the male owl to the female owl and owlet regularly to the nest usually at the night time. The foods which were not immediately consumed by the female owl and their owlet at night time remained on the nest that was the main source for study of food spectrum of owl. It was noticed that the female owl remained all the time on the nest during incubation of egg, brooding and care of the owlet, whereas the male owl supplied prey foods to nest because the male owl was not observed around the nest during the bright sunny day. However, the male owl was observed occasionally perched on a nearby mango tree in cloudy day time. Different species of prey food including large fish, frog, toad, rodent, snake, small birds and lizard (**Photo 5 and 7**) were supplied to the female owls and owlets on the nest. It was also observed that the food stocking rate was highest during the early brooding time in comparison to incubation period and late and after brooding period (**Photo 7-11**). The female owl and juvenile owlet frequently regurgitated pellets (Photo 12) on the sunshade nest and their status were also recorded.



Photo 1. The male owl (BFO) perched on a branch of mango tree closed to the sunshade nest.



Photo 2. The female owl (BFO) perched on the sunshade wall showing fairly reddish colored on flashlight photography eyes.



Photo 3. An egg of a brown fish owl laid on the sunshade nest of a house building.



Photo 4. Two eggs of a brown fish owl laid on the sunshade nest of a house building.



Photo 5. The female owl (BFO) brooding her owlet on the sunshade nest showing adequate number of prey foods including large fishes and frogs.



Photo 6. The female owl (BFO) brooding her two owlets on the sunshade nest showing two faces of these owlets with some prey foods.

Reproductive physiology of female owl



Photo 7. The female owl (BFO) brooding her owlet (white color) along with a large including rat, frogs and fishes.



Photo 8. The female owl (BFO) brooding her two owlets (white color) along with a prey foods in the nest.



Photo 9. The female owl brooding her owlet (white color) that owlet making noises.



Photo 10. The mother owl with her two juvenile owlets.



Photo 11. The female owl (BFO) with her juvenile owlet is resting separately on the nest after brooding period.



Photo 12. An owl pellet regurgitated on the sunshade nest showing a long bone inside the pellet.

Table 1. Physiology of reproduction of Brown fish owl recorded during six breeding cycles during November to March 2013 to 2019						
Breeding year	Egg laid on	Clutch size	Egg hatched on	Incubation period	Juvenile owl fledged on (days)	Total period of cycle (days)
2013-2014	30.11.2013	1	06.01.2014	38 days	07.03.2014 (60)	098
2014-2015	26.11.2014	1	01.01.2015	37 days	04.03.2015 (63)	100
2015-2016	04.12.2015	1	09.01.2016	37 days	10.03.2016 (61)	098
2016-2017	02.12.2016	1	08.01.2017	38 days	06.03.2017 (59)	097
2017-2018	06.12.2017	2	12.01.2017	37 days	06.03.2018 (54)*	091*
					13.03.2018 (61)**	098**
2018-2019	04.12.2017	2	10.01.2018	38 days	03.03.2019 (53)*	091*
					13.03.2019 (63)**	101**
Range		1-2		37-38	53-63	91-101
Average		1.33		37.5	59.25	96.75
*1 st owlet and **2 nd owlet of the clutch						

Owls are birds from the order *Strigiformes* which includes 227 to 244 species and 2000 sub-period and late and after brooding period (**Photo 7-11**). The female owl and juvenile owlet frequently regurgitated pellets (**Photo 12**) on the sunshade nest and their status were also recorded.

DISCUSSION

Owls are birds from the order *Strigiformes* which includes 227 to 244 species and 2000 subspecies of owls in the world.^{9,10} India has 33 species of owls including Brown fish owl.¹¹ Bangladesh has 15 species of owls (Family: *Tytonidae*- 1 species; Family- *Strigidae*: 14 species), of which 3 are endangered, one is vulnerable; seven could not be evaluated due to paucity of data.¹² The Brown fish owl (*Ketupa zeylonensis*) currently inhabits southern Asia from Asia Minor in the west to Vietnam and southern China in the east. Four modern subspecies are usually recognized in *Ketupa zeylonensis* on the basis of external morphology and geographical distribution:¹³ (a) *K. z. semenowi* ; Western brown fish owl, arid to desert areas from Asia Minor to Pakistan), (b) *K. z. leschenaulti* ; Common brown fish owl, Indian subcontinent to Myanmar, Thailand and China, (c) *K. z. zeylonensis* ; Sri Lankan brown fish owl and (d) *K. z. orientalis* ; Eastern brown fish owl; North east Myanmar, Vietnam and South east China. Of the three continental forms, the western *semenowi* is said to be paler than the central *leschenaultia*, while the eastern *orientalis* is said to be darker than *leschenaultia*.¹³ Voous (1988) treated *semenowi* and *orientalis* are treated as color variants of *leschenaultia*, recognizing two subspecies: the continental *leschenaultia* and the nominate *zeylonensis* from Sri Lanka.¹⁴ The later species is smaller and darker than the continental Brown owl and is generally considered to be well separated at the subspecies level.^{13,15}

Reproductive physiology of Brown fish owl

Brown fish owl is a species of owl that is part of the family known as typical owls, *Strigidae*. This species is an all-year resident throughout most tropical and subtropical parts of the Indian sub-continent to Southeast Asia and adjoining regions.¹⁶⁻¹⁸

Identification characteristics of the Brown fish owl are mostly solitary and nocturnal birds of prey with some extent of diurnal activities especially at cloudy weather typified by an upright stance, rufous brown upper-part with streaked black, pale under-parts streaked and barred brown, white throat, yellow iris, binaural hearing, sharp talons, and feathers adapted for silent flight and females are larger and heavier than males.^{1,6,19,20}

Human alteration and destruction of wildlife habitat causes significant impacts as the primary factor in the decline of raptor populations throughout the world including Bangladesh. According to the IUCN-Bangladesh Red Data Book, the last major survey of its kind in Bangladesh, some 43 species of mammals, 47 species of birds, 8 species of amphibians and 63 species of reptiles are on the verge of extinction now.²¹ Conservation group Wildlife Trust of Bangladesh (WTB) says nearly half of the 1600 species of vertebrate fauna are threatened by destruction of habitat, particularly deforestation.²¹ In addition to deforestation, Bangladesh has faced problem in the field of agriculture, industry, fisheries, navigation, salinity and ecology due to Farakka Barrage.²²

Many societies and cultures associate with owls with darkness, negativity and mystery while others associated with wisdom and prophecy.²³ The symbolic owl meanings used in the world include intelligence, brilliance, perspective, intuition, quick-wit, independence, wisdom, mystery, transition, messages, power, protection and secretes.^{24,25}

Brown fish owls generally live alone but will seek each other out when it's time to breed. The female will only mate with a male she truly trusts. However, barn owls are usually forms a bond with a mate for life. Other owls are stay together long enough to see the owlets leave the nest. Reproduction of owl is the period from laying and incubation egg and rearing owlets up to the fledging of juvenile owl.

The wild Brown fish owls are usually migrated to human habitat during winter months for prey and breeding due to loss of their natural habitat and occasionally they could successful for breeding in human habitat. One such displaced pair of wild Brown fish owl has been successfully utilized a building sunshade nest for reproduction during the six successive years from 2013. It has been reported that the owl nests in the hollows of large trees on river banks in the Gir forest,²⁶ and in the hollows of large mahuda tree on the edge of Sukhi reserved forest and Raipur dam.⁷ It appears that the nests of the Brown fish owl was located on the edge of the forest and water body in proximity of human habitation showing a unique choice of nesting site by the species. Although the Brown fish owl used the sunshade of a house for nesting that have some similarities with habitat because the sunshade is surrounded by two big mango trees and a big fish cultured pond.

This study recorded that the reproduction of the Brown fish owl was completed during the period from end of November to early March in each of the six years. It has also been reported that this bird species breeds between November and May in the Indian subcontinent and in Turkey juveniles is seen from June to July.^{16,27} However, the breeding season has been reported during January and February¹, January to April²⁶ and February to April⁷ elsewhere.

The female owl laid only a single egg in the first four clutches but the last two breeding cycles laid two eggs per clutch. These observations partially support the report made from India in which this species of owl laid two eggs in a clutch.⁷ It was observed that all the breeding activities including incubation of egg, brooding and care of the owlet were performed by the female owl alone during all the six reproductive cycles. These findings are in support of the earlier report.²³ However, these observations contradict an earlier report in which they have recorded that both parents attended the nest and owlets and both participated equally in activities of feeding and parental care detected by using the automatic night vision cameras.⁷

Owls can fly in complete silence, capturing and eating their prey before the prey has any idea of what's happened. This silent flight is made possible by their soft and fringe-like wings and the fact that their wings are quite large relative to their bodies.²³

Grossly, the male owl supplied the prey food especially fish, frog, toads, rodent (rats), snake, small birds, lizard to the nest for the female owls and owlets. These findings support the earlier reports.²⁸⁻³⁰ However, 18 types of food items belonging to various groups of invertebrates and vertebrates as 116 unidentified bugs, crabs and prawns, 48 frogs and toads, 20 snakes, three lizards, four fishes and one bird species without any rats have been recorded in earlier report.⁷

Several pellets regurgitated by the female owl and juvenile owls were observed grossly. Once an owl captures its prey, it usually swallows it head first and then whole. The owl's is usually digested and used everything except the bones, fur, and teeth of the prey. Then the owl regurgitates the un-digested parts as pellets.²³ Majority of the authors has used the regurgitated pellets for the analysis to detect the dietary composition of owls.^{8,31} This study has made possible to monitor the prey species and breeding biology of Brown fish owls directly on the nest made on the sunshade of a building.

Examination of nest sites for uneaten prey has proved useful by itself or in conjunction with other techniques.³²⁻³⁴ Direct visual observations, while requiring a great deal of investigator time, offer some advantages over pellet analysis. Several investigators preferred direct observation than pellet analysis methods^{33,34} and it may be the best technique to use for species whose pellets do not provide accurate representation of their diet.

The owls on the residential sunshade nest remained calm, silent and alert all the times during day and night times perhaps due to human residence house and rarely screaming and begging. This observation contradicts with the earlier report in which they observed that both the nestlings remained calm and silent during the day but at night, both are active after sunset and continued screaming and begging at nest made on the big tree.⁷

All owls face various threats including the great demand for live birds and their body parts for superstitious rituals in India and owls are trapped and sold in local markets for black magic.³⁵⁻³⁷ Therefore, these birds are never allowed to exist peacefully in the residential areas but this situation is somewhat different in Bangladesh.

Approximately 42% of all mammalian species in the world are rodents, and this amounts to about 2277 species of rodents.³⁸ Fortunately, on a global scale, only about 5 to 10% of the 2277 species of rodents are serious agricultural pests.^{39,40} Some 280 million malnourished people could benefit if pre- and post-harvest crop losses by rodents are reduced.⁴¹ Rodents consumed and destroyed cereal crops

including 0.3 million ton of paddy and rice and 0.03 million ton of wheat worth BDT 7.23 billion during 2015 in Bangladesh.⁴² Rodent pests are not only a serious constraint to the agricultural production of many crops but are known carriers of more than 60 life-threatening diseases of humans including the bubonic plague, salmonellosis, leptospirosis, typhus and viral hemorrhagic fever.⁴³ Existing approaches to control rats are often based on the use of acute poisons. Misuse of these poisons is unfortunately common in many countries including Bangladesh, posing a threat to human health and also causing environmental contamination by killing non-target species such as predatory birds.⁴⁴

All owls hunt at night when almost all the farm-yard fowls are at roost or under cover. In contrast, they concentrate mainly on rats and mice that are active at night and are serious pests of agriculture owing to their destructive habits. They annually destroy millions of pest rats and mice which eat up thousands of tons of grain and other farm produce.⁴⁵ So owls, though are polyphagous predators, can play a positive role in minimizing rodent populations below an economic threshold level at which their population achieve a pest proportion. The barn owl has successfully been used to control rats in oil palm plantation and rice fields of Malaysia where the damage caused by rats reduced from 6.7 to 2.3%.⁴⁶ The barn owl has also been successfully used for control of field rats in cocoa-coconut agroecosystems for rat management.⁴⁷

The use of wild barn owls in artificial nesting boxes for the control of rodents has been suggested a few decades ago and is implemented in many regions of the world.^{48,49} It has also reported that barn owl presence has a positive effect on crop yield, enhancing crop by 3.24% and allowing a net profit of US \$ 30/ hectare/year.⁵⁰ These results are important since they encourage farmers to use this environmentally friendly, healthy method owing to agricultural economic considerations, thereby evading the environmental-financial conflict. However, the owl and rodent project would help to control rodents to save the crops as well as wildlife.⁵¹ It would economical to encourage natural predator owls to control rodent population as a natural form of pest control. It appears that owls can play in the country and to create some respect towards these birds by highlighting their farmer friendly attitude. It would be an excellent thing to encourage to breed and multiply owls and also to protect the bird.

The main reason for endanger of owls is due to loss of their habitat. Humans are continuously altering owl habitat mostly due to deforestation with continued population growth and development and owls will continue to be at risk.

CONCLUSIONS

Deforestation and dead rivers due to diverted water are associated with loss of habitat of wildlife in Bangladesh. The Brown fish owl (*Ketupa zeylonensis*) is an all-year resident throughout Indian subcontinent to Southeast Asia including Bangladesh. They live by rivers, lakes, streams with well-wooded banks and feed mainly on relatively large fish and other small aquatic and terrestrial animals. These human made disasters have caused to reduce available food, shelter and breeding habitat of this fish owl that influenced them to migrate to human habitat for food and breeding which caused an increased human and wild-bird conflicts make them vulnerable. Continued research is needed to help protect owls from the impacts of humans

and how to maintain stable owl populations. The objectives of the wild and zoo birds are for the conservation, research, education, recreation, ecology and economic benefits. This article would help to encourage development of bird parks, to create awareness of bird life and generate interest in ornithology and to help promote conservation of endangered species of birds by captive breeding.

CONFLICT OF INTEREST

The author declares that there is no conflict of interest

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