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Status, Distribution and Breeding Biology of Lesser Spotted Eagle Aquila pomarina hastata in Keoladeo National Park

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INTRODUCTION

The Lesser Spotted Eagle Aquila pomarina hastata is endemic to the Indian Subcontinent. This paper describes its only known nest recorded for 81 years (Prakash 1988), and observations on its breeding biology recorded for the first time. Its present status and distribution in its known range is described. Unlike the nominate race *pomarina*, nothing is known about its ecology, except for general and incidental published notes on its occurrence, habitat and behaviour (Ali & Ripley 1982; Baker 1932; Davidson 1908; Whymper 1905; Jesse 1903; Anderson 1875). In the literature, wherever it occurs, it has been described as rare (Ali & Ripley 1983). Its distribution covers the Gangetic plains east through Bihar, Bengal and Bangladesh, and south to Madhya Pradesh and Orissa. One record is from as far as the Nilgiris in Tamil Nadu in south India. In Assam, it occurs both north and south of the Brahmaputra and also in Manipur (Ali & Ripley 1983).

STUDY AREA

The Keoladeo National Park, situated at $27^{\circ}7.6-27^{\circ}12.22$ N and $77^{\circ}29.5-77^{\circ}33.9$ E is 2 km south-east of Bharatpur city and 180 km south of Delhi (Figure 1). It covers about 29 km² of flattish terrain sloping to a slight depression of about 8.5 km² in the centre. This forms the main submersible area of the park and has been divided into several unequal compartments by dykes (Ali & Vijayan 1986). The average elevation of the area is 174m. Extremes of climate are experienced with temperature varying between 1°C and 50°C.

Apart from the wetland, the park has ca. 20 km² of woodlands, savanna type grasslands and savanna with thickets. In some compartments the marshes have scattered mounds planted with Acacia nilotica, and are also bordered with these acacias, the other tree species being Mitragyna parvifolia, Sizygium cumini and Prosopis spicigera.





DISTRIBUTION AND STATUS

Surveys have been carried out in the Lesser Spotted Eagle's known distribution range in selected wildlife sanctuaries and national parks in the Gangetic plains, Northeast India and the states of Rajasthan, Gujarat, Tamil Nadu and Kerala. These formed part of the Bombay Natural History Society's ongoing project on "The status and distribution of raptors in India with special reference to the endangered resident raptors". The data from raptor surveys carried out in different areas since January 1990 have been taken into consideration.

Preliminary surveys were carried out by counting birds, driving slowly on motorable roads in the areas visited. Certain otherwise inaccessible areas were also covered on foot. Information on the occurrence of the species was also collected by local inquiries. So far, intensive surveys have been carried out only in different national parks and sanctuaries in North Bengal, North-east India and the Gangetic plains.

During the intensive surveys carried out in 14 national parks and wildlife sanctuaries in the North-east, North Bengal, the Gangetic plains, Rajasthan and Gujarat, the species was sighted in only six different areas (Figure 2): Keoladeo National Park in Rajasthan, Corbett National Park, Dudhwa National Park, forest around Dehradun in Uttar Pradesh, Banni Grassland in Gujarat and Jaldapara Wildlife Sanctuary in North Bengal. Intensive surveys are now being carried out in various other national parks which will give better indication of the species' status. Details of these will be published elsewhere (Prakash in preparation).

The only known nest of the eagle is at Keoladeo National Park, Bharatpur, and was first spotted only in 1986. The earlier nest was seen 81 years ago. Prior to 1986 there were just three records of nesting (i.e. Jesse 1903 in Lucknow, Whymper 1908 in Nepal and Davidson 1908 in Mysore) (Figure 2).

METHOD

The nestbuilding and incubation period were studied with the help of a 29 X telescope from the ground. The nestling period was studied from a 6x3 blind made of bamboo cot with jute matting at the base and a rectangular grass structure on the top, and placed on an adjacent tree, *ca*. 75m away from and level with the nest. The egg, nest and nestling were not measured or ringed to avoid disturbance.

RESULTS

Breeding Biology

The Lesser Spotted Eagle is a resident bird of the Keoladeo National Park and is observed throughout the year. The female of the pair which nested in the park was seen in the same territory but near the marshes during the winter. The territory was Figure 2. Known Distribution of Lesser Spotted Eagle and Location of Recent Surveys and Sightings.



also defended in winter (Prakash 1988). The male was not observed during the winter, probably having moved out of the park due to intense competition from the influx of congeneric wintering raptors (Prakash 1988). Both birds were seen in the nesting territory during the last week of March.

Eyrie Site

The nest was on a 13m tall *Mitragyna parvifolia* and was placed in a fork about Im below the top. The tree was at the southern edge of a large *Mitragyna parvifolia* grove in block Ls. (Figure 1) which was surrounded by savannah type grassland. The grove extended up to the edge of the waterline in the north. The nest tree was surrounded by a thick understorey of *Capparis sepiaria* and *Kirganelia reticulata* which climbed up the tree to a height of *ca*. 5m. There was no other nest in the tree. Two species of raptors, namely White-backed Vulture *Gyps bengalensis* and Dusky Horned Owl *Bubo coromandus* were nesting within 150m of the nest. One vulture's nest was on an adjacent tree. The eagle's nest was also located in April 1987, 1990 and in 1992. In each of these four years the nest was at a different site, far from that of the previous year, although in a similar habitat (Figure 1). During 1986, 1987 and 1990 the nest was on *Mitragyna parvifolia* whereas in 1992 it was on *Ficus relegiosa*.

Eyrie

The large circular, flat nest was made up mainly of sprigs of Acacia nilotica and Mitragyna parvifolia. The central depression was lined with fresh leaves of Syzygium cumini, while the base of the nest was formed mainly of thicker twigs of Mitragyna parvifolia.

Nest-building

Nest building could not be studied until 1990. Observations begun in that year are still in progress, confined to mornings between 0600 to 0930 hrs. The female usually brings the sprigs and arranges them on the nest, while the male occasionally brings one, but the female arranges it (rate of sprig delivery, female =2/hr., male = 0.5/hour, total observation = 20 hrs). The sprigs are brought in the beak, mostly picked up from the ground but sometimes plucked from the tree while perched on a branch. They are usually brought from a site about 100m away and never beyond a 100m radius from the nest.

Coition

Coition could be observed only during 1992. It was seen just before the birds commenced soaring, between 0930 to 0945 hrs., and in the afternoons usually after soaring. The female would perch on a shaded branch and crouch a little; the male would come flying and land straight on her back. Copulation lasts for 6-8 seconds (n=5). It takes place away from the nest and at different sites. Probably both birds call during the act.

Figure 3. Temporal Distribution of Time of Male and Female.



Hours of Day

Egg

There was a single, oval, white egg with prominent reddish speckles. In all four years, a clutch of only one egg was recorded.

Incubation

Thirty hours of observations were spent, spread over two full days, the 10th 20th incubation days respectively, to determine parental care during incubation. Both sexes incubated, the female for most of the day (88%) during the observation period (Figure 3). The longest shift of the female was recorded on 21 May 1985, when she incubated continuously for 7 hrs. 41 mins from 14.19 to 20.00 hrs., when observation ended. Probably she continued incubating the whole night also.

The male incubated for only 2% of the observed time (1200-1500 hrs.), although it was alone on the nest for 8% of the observation time. For 6% of the time it stood in the nest half-crouched with slightly spread wings, shielding the egg against the sun (Figure 3).

The changeovers were not accompanied by rituals. The female would start calling at the sight of the incoming male and leave the nest before he landed. However, the male would not call when the female came to relieve him but would stay for some time, about two minutes, and then fly out. The nest was never left unattended, except for a few seconds at the time of takeover by the male.

The male did all the hunting and brought food to the nest. The prey was invariably carried in the beak. Among the prey brought, the majority were Garden Lizards *Calotes versicolor* and Field Rats *Millardia meltada*. The male took over incubation after the delivery of prey (n=4). On the 10th day of incubation, after such a delivery, the male waited on the nest for an hour but the female did not budge. A similar observation was made on the 16th day also. The female never devoured the prey on the nest but took it to a nearby tree. Sometimes at changeover she went off the nest without the prey. Once she came back after 1 hr. 28 mins. and again went out immediately with the prey, returning after about 3 minutes. Egg rolling behaviour was observed only twice. It lasted for 15 sec. It was performed by gently pushing the eggs towards the body with the beak.

Hatching

The egg hatched on 12 June, the 30th day of observation. The actual hatching could not be witnessed but the chick was seen on the same day. The young had dirty greyish-yellow prepennals, the gape mustard yellow, darkish forehead and crown, and tufts of white down in place of rectrices. It had partly open eyes and its neck rested on the nest.

Nestling Period

The eaglet fledged on 21st August, after 71 days. The following is an account of

its development as observed from a blind:

First week There was no apparent change in the overall appearance of the eaglet. By the end of the week it was crawling about the nest on its tarsi. It was alert and the eyes were open.

Second week It had developed a second coat of white downy feathers or preplumulae. The contour feathers were emerging through the down on the alar and caudal tracts like dark pin heads. The skin around the eyes and auricle was dark and naked.

Third week The feathers on alar and caudal tracts were in brush stage and black pinheads of feathers were seen on the humeral tract. The rest of the plumage was almost like the second week's with the ear patch still bare and dark.

Fourth week By the end of this week the rectrices and secondaries had emerged from their sheaths and the feathers on the humeral tract were in the brush stage. The eaglet stood firm on the nest but tumbled on attempting to walk.

Fifth week The feathers on the spinal and femoral tracts were in brush stage and on the occipital tract in pin stage by the end of this week. Feathers all over the ventral tract, which bifurcates before the crop, were in pin stage. The feathers on the humeral tract were out of the sheath and the remiges and rectrices had grown longer. The coverts were mostly in brush stage.

Sixth week All the tracts had feathers which were in brush stage on crown, breast, flanks, legs and ventral tract. The entire capital tract had become dark and the face had the adult appearance except for the white above the eye, forehead and crescent behind the dark ear coverts. The chin and throat also had white down. The primaries, secondaries and rectrices were tipped white and the greater coverts edged white. The ventral side of the remiges and rectrices had black bars. The femoral and crural tracts still had white down.

Seventh week The eaglet was dark brown all over and the dorsal side of the wing was also dark brown except for the white tips of primaries, secondaries and edges of greater coverts. Some white downy feathers jutted out among the wing feathers, giving it a spotted appearance. Down feathers could also be seen as broad strips above the eyes, a crescent-shaped patch behind the auricle and a white patch on the rump. The chin, forehead and throat also had white down. The feathers on spinal, femoral and crural tracts were all dark brown tipped with reddish brown.

Eighth week Head and crown all dark, except the gap between the two occipital feather tracts, which still appeared as a white parting line; white down feathers were still present on forehead above eye, chin and throat. The remiges and rectrices were growing and had the sheath at the base of the calamus.

Ninth week Contour feathers were in brush stage on the chin and white down feathers were still jutting among the wing feathers.

Tenth week The feathers on chin and throat had grown longer and were all dark brown. The parting line on the head was still there, while down feathers continued jutting out among the wing feathers. The feathers on the nape had white bases. Eleventh week The chin had become all dark, while the breast, flanks and femur feathers had tips of pale reddish brown. The greater coverts had white edges and the remiges and rectrices were tipped white. Down was still jutting out among the feathers. The ventral part of the wings had dark bars on the tips of the feathers. The ventral side of the tail and some of the upper tail coverts also had bars.

Parental care

Brooding

Brooding was done mostly by the female, the male's contribution being negligible. During the first week the female spent 88% of the observed time brooding (Figure 4). This gradually diminished with the growth of the nestling and in the seventh week the female had stopped brooding altogether. She probably stopped brooding at night also by the eighth week, as she was never observed on the nest but was seen perched a foot way from it at dusk and dawn.

While brooding, the female sat very close as if incubating. In the third week she was brooding in the sitting posture, also shielding the young by spreading one or both wings. As the eaglet grew, it became increasingly active and the female found it difficult to brood.

Feeding the young

The male brought most of the prey to the cyrie and the female fed the young. The smaller prey such as Garden Lizards and rats were brought in the beak and the bigger ones in the talons. All the smaller prey were brought whole to the nest with no apparent sign of injury. The bigger prey such as Purple Moorhen *Porphyrio porphyrio*, Rufoustailed Hare *Lepus nigricollis* and Bull Frog *Rana tigerina*, were brought partly eaten. On average the frequency of prey delivery was 3 per day (Figure 5). The food was brought exclusively by the male except during the seventh week of the nestling period when the female also brought prey, but significantly less than the male (n=30: male 93%, female 7%).

In all, 10 species of prey were brought, and 4 species were found stored in the nest (Table 1). Mammals were the dominant prey (47%) followed by birds (33%), reptiles (16%) and amphibians (3%) (Table 1). Among mammals, rats and Five-striped Palm Squirrels *Funambulus pennanti* were the most preferred (94%) followed by hare (6%). The terrestrial birds such as young Stone Curlew *Burhinus oedicnemus*, Blue Jay *Coracias bengalensis*, Grey Partridge *Francolinus pondicerianus*, Common Myna *Acridotheres tristis*, Bustard Quail *Turnix suscitator* and Pipit *Anthus novaeseelandiae* were preferred (58%) more than marsh species (42%) such as Red-wattled Lapwing *Vanellus indicus*, Purple Moorhen and egrets *Egretta* spp. (Table 1). Garden Lizard was the sole representative among the reptiles in the prey items. Similarly Bull Frog was the only amphibian represented. The prey species diversity index was quite high

Prey species	No.	% of prey species	% of class of prey	Remarks
MAMMALS	,		47.3	
Millardia meltoda	9	25		stored on the nest
Funambulus pennanti	7	19		**
Lepus nigricollis	1	3		
BIRDS	12		33	
Vanellus indicus	3	8		
Porphyrio porphyrio	1	3		
Egretta sp.	1	3		н
Francolinus pondicerianus	2	6		
Turnix suscitator	1	3		
Coracias benghalensis	1	3		
Acridotheres tristis	1	3		
Burhinus oedicnemus	1	3		
Anthus sp.	1	3		н.
REPTILES	6		17	
Calotes versicolor	6	17		
AMPHIBIANS	1		2.7	
Rana tigerina	1	3		

Table 1. Prey items recorded at nest of Aquila pomarina hastata.

Table 2. Approximate weight of some of prey items of Aquila pomarina hastata

Species	Weight (in g)	Source	
Millardia meltoda	100	Av. of 2 freshly killed specimens	
Funambulus pennanti	150	Av. of 5 freshly killed specimens	
Lepus nigricollis (young)	500		
Vanellus indicus	190	Ali & Ripley 1983	
Egretta sp.	900		
Porphyrio porphyrio	662	"	
Francolinus pondicerianus	256		
Turnix suscitator	-	"	
Coracias benghalensis	166		
Acridotheres tristis	110	11	
Burhinus oedicnemus	-	11	
Anthus sp.	21	H.	
Calotes versicolor	25	Av. of 2 freshly killed specimens	
Rana tigerina	200	Abdulali (1985)	









(Shannon-Weiner index H=2.213). Field rats (9) were the single largest prey item, followed by squirrel (7) and lizards (6) (Table 1). There was a significant difference in the preference of prey species ($c^2 = 29 P < .01$).

The eaglet was fed entirely by the female. During the first and second weeks she gave only the red meat from the breast and shoulder of the prey, swallowing the intestines and other parts herself. The feeding frequency rose to six in the fourth week and afterwards became increasingly variable (Figure 5). The eaglet had started pecking at the prey in the second week. During the third week it picked up some from the nest while the female was feeding it. It started picking up and swallowing large chunks of meat in the sixth week. During the fifth week it swallowed an entire rat which it took straight from the male's beak. From the seventh week the young had started taking the prey itself but had problems in tackling squirrels, probably because of their tough skin. Up to the eighth week the female tore the squirrel and fed it to the young. The eaglet was feeding entirely on its own in the tenth week.

The female brought prey only in the seventh week. During the subsequent weeks, she remained perched in the nest vicinity. From the eighth week onwards she started coming to the nest when the male brought prey and devoured some of it immediately, without feeding the eaglet.

The time spent feeding the young was longer during the early weeks because of the greater number of morsels offered. This gradually decreased as the morsel size increased. In the sixth week the eaglet had started feeding on its own also and was eating much more food which, because of its inexperience, was more time-consuming. Hence the increase in the time spent on food consumption from the sixth week (Figure 7). Until the eaglet fledged, the time spent in prey consumption gradually lengthened as it started feeding more by itself. The food it consumed was visually estimated (Figure 6). During the first week only about $\frac{1}{8}$ of the prey (39 gm), the second week about $\frac{1}{4}$ (148 gm), the third week also $\frac{1}{4}$ (239 gm) and the fourth week about $\frac{2}{3}$ (268 gm) of the food brought was given to the eaglet. From fifth to seventh week the eaglet was fed almost on the whole prey (450 gm). The female was taking about one percent, as she was seen picking up only the tid-bits.

During the eighth week there was a sharp fall in the eaglet's food consumption, mainly because the female ate two out of three prey items herself. During the eleventh week also the female took two prey items without feeding the young.

Fledgling Period

No systematic observations could be carried out on the post-fledging period. The fledgling could not be traced for the first two days after fledging. Although the male brought a Garden Lizard to the nest on the day it fledged, the young did not come to the nest. It was sighted two days later with the female on a *Mitragyna parvifolia* tree, 50m from the nest site. The male brought a lizard which the young snatched from his beak as soon as he landed. It kept calling all through. It was again sighted some 300m

Figure 6. Food Intake of Eaglet.



Figure 7. Time Spent by Eaglet in Consuming Prey.



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from the nest. Whether it was distrurbed by the hordes of grass cutters who came near the nesting site is not clear. It remained about 500m away from the nest, on which it was never seen again. After a month the parents avoided the young. On the 35th day after fledging the young was seen feeding on a squirrel on the ground. There was no sign of the parents. It was then mobbed by a Greater Spotted Eagle *Aquila clanga* but the parents did not come to its rescue, although it kept calling. Probably it hunted the squirrel by itself. The young bird was regularly seen alone in that area for 47 days till 8th October.

Roosting

The female roosted on the nest till the seventh week but later roosted on a branch a foot away. During the post-fledging period she changed her roost, which could not be located. The male roosted 100m north of the nest tree on a *Mitragyna parvifolia* at a height of 10m throughout the nesting period. The eaglet in the post-fledging period kept changing its roost but never roosted on the nest. On the fourth and fifth day of fledging it roosted on a tree some 50m distant from the nest tree.

Nest defence and interspecific actions

The Crested Honey Buzzard *Pernis ptilorhynchus* was well tolerated; once a bird flew just over the nest tree without evoking any response in the eagle. The vultures were observed sitting just a few feet away without causing any alarm. The Black-shouldered Kite *Elanus caeruleus* and Short-toed Eagle *Circaetus gallicus* hovered some 200m away from the nest without evoking any response. The roosting pair of Dusky Horned Owl also never interacted with the eagles.

House Crows *Corvus splendens* constantly harassed the incubating bird and sometimes the nestling. The eagle's only reaction was to give alarm calls without budging. Usually during incubation, the male would come and drive the crows away. The nestling would also give alarm calls attracting the female, who would chase the crows away.

Reaction to man

The female was quite tolerant of man's presence in the vicinity of the nest site. She would display typical "intruder reaction" (Brown 1986) on the approach of a man. She did not flush till I was half-way up the nest tree. She also continued brooding while the blind was being erected on the adjacent tree. While I was going up to the hide she would fly off but would come back within ten minutes. Slight movement in the blind did not bother her at all.

Potential nest predator

A Monitor Lizard *Varanus bengalensis* once came onto the nest in the eleventh week, possibly for the meat lying in the nest. By that time the eaglet was fully grown and could successfully chase it off. It could have posed a serious threat to an unattended

egg or a young hatchling. The Mongoose *Herpestes edwardsi* is another predator capable of harming the nest.

DISCUSSION

This nest was recorded 81 years after Whymper, who described one in 1905. Prior to the present case there are just three records of the Lesser Spotted Eagle's nesting in the subcontinent (Jesse 1903; Davidson 1908; Whymper 1908). Apart from rarity, the other plausible cause could be that very few people look for eagle's nests in the country. But the very few sightings of the bird during the current survey is a cause for concern in only six areas in its distribution range.

The breeding biology of this species has not so far been described. It would be premature to give any generalization on the basis of observations at one nest; nevertheless, this study gives some idea of its breeding biology, which is important in evolving a conservation strategy for the species.

The breeding biology of this race has some similarities with the nominate race. The nest, nest site, role of the sexes in incubation and feeding the nestling are generally similar (e.g. Meyburg 1969). There is, however, variation in the clutch size, nestling and fledgling periods.

The incubation period must exceed 30 days. It has not been recorded earlier for this race. In the nominate race it is 42-44 days (Ali & Ripley 1983; Brown & Amadon 1968). While the female does most of the incubation, the male does the hunting. Newton (1979) characterized three types of division of labour between the sexes in raptors during incubation: (1) No incubation by the male (2) temporary relief and incubation by the male while the female feeds and rests, and (3) equal sharing of incubation by both sexes. Lesser Spotted Eagles are typical of the second category.

The development of feathers in the Indian race, as noticed in the present study, and in the European race as reported earlier (Brown & Amadon 1968), is almost similar. The sequence and development of feathers were identical to the Golden Eagle Aquila chrysaetos (Ellis 1979) and it seems that most raptors follow a similar sequence of feather development (Brown 1976).

There was a distinct division of labour between the sexes in caring for the young and obtaining its food. The former was done by the female and the latter by the male. One factor responsible for this habit may be the semi-altricial growth of the nestlings. Altricial young are poikilothermic for several days after hatching and must be brooded by an adult until able to thermoregulate (Ricklefs 1974). They also require protection even after this. Therefore, in monogamous birds with altricial young, both adults must help raise the young to independence. By dividing the task, a female Lesser Spotted Eagle is free to brood the young while the male forages for the entire family. The male being smaller in size, it must be energetically less expensive for it to hunt than for the female. Brooding was done entirely by the female, as has been recorded in the nonominate race also (Brown & Amadon 1968).

Prey delivery was the highest during the seventh week, when the female also brought prey. Later the number of visits declined till the last week of nesting, when there was a slight increase. There was no fall in prey delivery during the week the nestling fledged, as observed elsewhere in other raptors (Brown 1976). On the contrary, there was a slight increase. The male brought all the prey throughout the nestling period except for the seventh week. There was no steep increase in prev delivery by the female or steep decline by the male during the latter part of nestling period, as recorded by Brown (1976) in other raptors. The high prey species diversity (H=2.25) indicates that the Lesser Spotted Eagle is a "generalist" in its choice of food. The preferred species were Field Rat (25%), Squirrel (19%) and Garden Lizard (17%). The Field Rats became vulnerable in summer because there was very little grass cover left. The agricultural fields just outside the park were also absolutely barren. This probably made for easy predation on rats. Squirrels, which also form a major prey of the eagle, were feverishly busy making drays during the summer and consequently had become quite conspicuous and probably less wary. The Garden Lizard's population is highly visible during summer, which is their breeding season when males display from exposed positions. This probably explains the high percentage in the eagle's kill. Most of the avian prev bred in summer except Purple Moorhen and the egrets. Breeding birds fall prey to predators (Wallace 1963) because they are preoccupied with breeding and become less wary of predators; moreover they become more conspicuous because of brighter plumage and greater activity.

The gradual increase in food consumption by the eagle till the sixth week and then subsequent levelling off followed the growth pattern of raptors as described by Newton (1979), but the sharp increase and fall during the seventh and eighth weeks respectively, followed by a fluctuating rate of consumption, do not accord with the growth pattern. Probably the rate of consumption recorded may not be quite correct, as the observations were made once a week and the food taken during the intervals between observations was not accounted for.

The grabbing of prey by the female without feeding the young is worth noting. As she had to guard the nest, she had to confine herself within a minimum 100m radius of the nest. Hunting at such close quarters would be inadvisable on account of attracting predators to the nest. Moreover, the area is too small for an effective hunt. Therefore she had to depend entirely on the food brought to the nest by the male. However, denial of the prey to the young may not be a "selfish act"; it may be part of a scheme by the parents to coax the young out of the eyrie. Such behaviour, where the parent or parents bring prey to the nest and devour it themselves, has also been reported earlier (Brown 1976).

Possible Causes of Decline in Numbers

Shrinkage of Habitat

The eagle prefers a habitat of tree groves surrounded by grassland and fields. Such habitats are shrinking fast because of encroachment and conversion of forest land into agriculture. Such habitats are mostly available outside the parks and sanctuaries.

Effects of Environmental Contamination

Environmental contamination could be a serious threat to the existing population. They feed mainly on birds, rodents and reptiles, often in agricultural fields. Largescale and indiscriminate use of persistent insecticides and pesticides is extensively employed. The birds and rodents which feed in these fields are in turn eaten by the raptor.

Competition From White-backed Vultures for Nest Sites

The number of vultures has increased sharply in India, mainly because of inefficient carcass disposal. In Keoladeo National Park, which has a small area of 29 km² a minimum of 353 nests of White-backed Vultures was recorded (Prakash 1988). They have occupied all optimal and suboptimal nest sites, thereby excluding other large raptors. In every year, as soon as the Lesser Spotted Eagle finished nesting, the nest was occupied by White-backed Vultures and most still had nestlings when the Lesser Spotted Eagles started to breed the next season, thereby being forced to look for a new nest site.

STEPS FOR CONSERVATION

Intensive Surveys

Intensive surveys in the species' known distribution range should be carried out and all individuals present should be identified. Studies on its ecological needs, habitat and food preference should be undertaken. The main causes for its decline should be identified.

Identification of all Active Nests

All active nests in the species' distribution range should be located. Attempts should be made to get information on its nesting requirements, breeding success and dispersal of the young. If possible, nestlings should be fitted with radio transmitters to get a better idea of their dispersal. Nest sites should be protected against vandalism by locals.

Protection of Habitats

Based on the available information on its habitat requirements, such habitats should be protected whereever the eagle is reported. A fairly detailed description of its habitat utilization and preference is given in Prakash 1988. It was seen to prefer marshes close to grassland and forest during winter and groves of tall trees surrounded by grasslands in summer. It is known to prefer tall tree groves near open areas, grasslands and cultivation. There is substantial habitat of this nature outside protected areas; there is a need to identify such areas and ensure their protection.

Bioaccumulation of Pesticides and Heavy Metals in the Species

The accumulation of heavy metals and pesticides in the body tissues should be studied, to get an idea if environmental contaminants could be a cause of the species' decline. Efforts should be made to persuade locals to avoid use of these chemicals.

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