10. HATCHING, GROWTH AND BEHAVIOURAL DEVELOPMENT OF YOUNG

10.1 INTRODUCTION

Hatching and further development of the young usually follow species specific pattern that had been developed through a long course of evolution. The main objective of reproduction and parental care is to attain a high individual fitness which is measured in terms of number of fledglings that successfully leave the nest and are able to fend for themselves. (Lack, 1948 ; 1949 ; 1966 ; Perrins, 1964 ; 1965 ; Schifferli, 1973 ; 1978 ; Moss et. al., 1981). So to study hatching and development of birds its interrelationship with other components should be considered.

Attempts have been made to discuss to the general trend of hatching, hatching success, hatchling growth pattern young and some early behavioural aspects of the young.

10.2 METHODS

The nests were inspected daily during the hatching period. Efforts were taken to complete inspection as quickly as possible in a way so as to make negligible disturbance to the birds and hatchlings. The progress and development of al nests were followed until the last young left the nest. Binoculars (7.15 x 35x with Zoom) were used whenever required. The nesting trees as also the nests in each tree were marked.

Hatching success is calculated as a percentage of eggs that produced hatchlings. Fledging success is calculated as a percentage of hatchlings which developed to fledglings. Over al reproductive success, however, is measured as the percentage of eggs which developed to fledgings. The ability of the fledglings to fly across the trees away from the nests was considered to be successful fledgings.

A spring balance, Pesola scale of 2000 gm with 0.5 gm. sensitivity was used to weight the nestlings. Measurements of tarsal and wings was taken by a metal scale graduated to 1 mm.

Egg disappearance factors were identified according to the following assumptions. In case of egg predation, the predator which is most cases were crows, usually pick up the egg with the beak and fly away to a far off safe place to consume the booty.

10.3. RESULTS AND DISCUSSION

10.3.1 Hatching

Brood reduction in Little Cormorants and Night Herons is accomplished through asynchronous hatching, variation in egg size (as per laying order), low fledging weight but with small variation in clutch size. Asynchronous hatching is also common among storks (Coulter *et. al.*, 1989 ; Datta and Pal, 1990). Like other birds they are also nidicolous, eyes remain open in Night Heron and closed in Little Cormorant at hatching. Interval between piping to hatching ranged between 10-22 hours in Little Cormorant and 14-25 hours in Night Heron.

Harching interval between successive youngs was 34$\pm$ 6 hours in Little Cormorant and 33$\pm$8 hours in Night Heron.

10.3.1.1. Hatching and fledging success at different phases of breeding season

In Little Cormorant

Table 10.1 shows the hatching and fledging success at different phases of breeding season in Little Cormorants out of a total of 820 eggs studied, overall hatching and fledging success increased as the laying date progressed. Hatching success was 68.96% in the first phase, 74.46% in the second and 79.39% in the third phase. Fledging success was 56.49% in

the first phase, 61.15% in the second and 64.24% in the third phase. Table 10.1 also shows that this is the general trend for all the clutch size categories.

In Night Heron

Table 10.2 shows the hatching and fledging success at different phases of bereeding season in Night Herons out of a total of 949 eggs studied, overall hatching and fledging success increased as the laying date progressed upto second phase. Hatching success was 69.90% in the first phase, 73.42% in the second and 72.88% in the third phase. Fledging success was 54.26% in the first phase, 56.28% in the second and 53.67% in the third phase. Table 10.2 also shows that this is the general trend for all the clutch size categories.

Table 10.3 and Table 10.4 shows the main factors responsible for loss of egg and hatchling, and success of hatchling and fledgling in Little Cormorant and in Night Heron. In Little Cormorant predation accounted for a maximum of (10.87%) egg loss in the first phase but subsequently declined to 3.03% in the third phase. Similar declines in percent egg loss are also observed for rain / storm and nest-material stealing. Percent egg loss due to failure of hatching on the other hand increased from 10.34% in the first phase to 14.54% in the third phase. On the whole 72.92% eggs hatched into hatchlings.

In Night Herons predation accounted for a maximum of (9.47%) egg loss in the first phase which subsequently declined to 3.95% in the third phase. Similar declines in percent egg loss are also observed for nest material stealing. Percent egg loss due to rain / storm decreased in the second phase but increased in the third phase. But percent egg loss due to failure of hatching increased from 10.90% in the first phase to 11.86% in the third phase. On the whole 71.75% egg hatched into hatchlings.

It was found that number of unhatched eggs increased as the breed-

ing season progrased while mortality due to other factors such as predation, fall from nest due to rain / storm and fall due to stealing of nest materials declined with season. It is already mentioned that the late layers mostly comprised of young first time breeders and less-mature birds who may actually fail to fertilise the eggs due to behavioural or physiological constraints. On the other hand predation, comptition and environmental factors are at their most in the first phase of breeding than at any other time which causes increased egg loss in the first phase. Predation of egg by crows has been reported for various bird species (Baker, 1940 ; Picozzi, 1975 ; Verbeek, 1982 ; Salathe, 1987).

Table 10.3 and 10.4 also shows that the main factors for hatchling loss are starvation, fall from the nest and predation. Out of these factors starvation appeared to be responsible for maximum loss, amounting for 5.97% in Little Cormorants and 9.37% in Night Herons on the whole. Predation and fall from the nest on the other hand accounted for 3.04% and 4.14% in Little Cormorant and 2.52% and 5.05% in Night Heron respectively.

Loss of hatchlings was highest due to starvation probably for two reason : one is behavioural and the other ecological. It is a well known fact that there is intense competition among known fact that there is intense competition among hatchlings from the time of hatching. As a result the heavier hatchlings get more and more heavier and stronger while the lighter hatchlings get relatively more and more lighter and weaker in time and ultimately succumb to death. The ecological reasons on the other hand is availability of adequate food materials. It is seen that starvation death is highest in the second phase on the whole is highest. It may be mentioned that the hatchling period extends over a period of fours weeks so that hatchlings of the first phase overlap in time with those of the second phase, similarly hatchlings of the second phase overlap with the hatchlings of the third phase. As such, it is reasonable to believe that scarcity of food materials suitable for hatchlings

is adequately available in the second phase. The reason for the decline of the hatchling predation is similar to that stated for egg predation. Loss of hatchlings due to fall from the nest was found to be maximum in the third phase. This is probably due to three reasons : sudden appearance of post-monsoon storms which are quite violent, breeders of the third phase are young and inefficient in nest construction and over crowding of nestlings.

Fledging success increased upto second phase and decreased in the third phase in both the bird species. This is probably because of the fact that both biotic and environmental constraints decreased as also due to the fact that the nesting pairs had to attend or rear lesser number of hatchlings per pair in Little Cormorants and in Night Herons.

10.3.1.2. Clutch size and Productivity

Productivity (number of fledglings / nest) was higher at larger clutches in both the bird species (Table 10.5and 10.6). Similar observations were made by various authorities in diverse bird species (Perrins, 1965 ; Tomilson, 1975 ; Rodgers, 1980 ; Prat and Winkler, 1985). The common clutch size was not always most productive. In Little Cormorants and in Night Herons clutch of 4 and clutch of 3 were most common in the sanctuary but the most productive were the broods of 5 (Pal & Das, 2003) and broods of 4 respectively. In a number of bird species including Great tit, the most common clutch size is smaller than the most productive one (Klomp, 1970 ; Perrins and Moss, 1975). These data contradicts Lack's (1954) theory that parents raise as many young as they can do with existing food supply. In essence Lack's prediction states that the most common clutch size should be the most productive one. Results of the present study and similar other studies are probably quite consistent with the view that selection maximizes lifetime reproductive success rather than the effort during any particular season. The relationship between resources and effort should vary alongwith different other factors (Williams, 1966 ; Pianka and Parkar, 1975).

10.3.1.3. **Adaptive significance of hatching asynchrony**

Asynchronous hatching produces size heirarchies in broods. Such size hierarchiers is interpreted as adaptive because they can allow elimination of smaller chicks by selective starvation, when it appears difficult to sustain the entire brood (Lack, 1954 ; Ricklefs, 1965). Asynchronous hatching was not advantageous in terms of productivity but surely it was advantageous in terms of "parental investment" (Trivers, 1972). In the present study asynchronous hatching in both the birds species, the early mortality of nestlings resulted brood reduction at an early phase for the better survival of the remaining youngs and saves parental investment which enhances future reproductive output of the parents. The last egg was probably used by the mother as a hedge against other eggs or hatchlings of early age and thus it acted as an "insurance" (Nisbet, 1973 ; Stinson, 1979).

10.3.2. **Hatchling growth**

Table 10.7 and 10.8 shows the growth of hatchlings in body weight and length and linear dimensions of four body parts i.e. beak, wing, tarsus and tail in Little Cormorants and Night Herons. Little Cormorant hatchlings on emergence appear black, covered with naked skin, fleshing bald head and on naked scrawny neck. Eyes remain closed and it opens on the fifth day. Tail feather is also absent. Feet are webbed. On sixth day tail (rectrices) appears. One week old body covered with dingy black down. Body feathers appear on the 14th day and afterwards.

In the other hand chicks in Night Heron chicks appear rather mature as a day old chick is covered with natal plumage or down on the head, neck and dorsal portions of the body which varies from a dark mouse gray to a deep neutral gray. The outer three fourths of the crown filaments are white. These white lips are very conspicuous in the freshly hatched chick but after a few days exposture to the sun and air they because in conspicuous. The down

of the crown is much longer than that of the body so that conspicuous crest is fromed. The first juvenile plumage make their apearance in the region of the flank and scapulars on the fifth day after hatching. The adult plumages are acquired in the Night Herons by partial most within two years at Kulik. Fig. 10.1 and 10.2 shows the weight gain of the nestlings and fig 10.3 and fig 10.4 shows the tarsal and wing growth in the two species studied.

10.3.3. **Behavioural Development**

On the day of hatchling chicks remain motionless which persists for two to three days in Little Cormorant and one to two days in Night Heron. At the stage their movements lack co-ordination and neither species are able to stand on their feet. They go on sleeping in the nest and are constantly protected by the parents. With progress of time food begging behaviour and other associated nestling motor patterns appear.

10.3.3.1. **Food Begging Behaviour**

One to three day old chicks stried to swallow any food materials inserted into their mouths by the parents but soon rejected the same. At this stage almost al the ventral part of the body touches the substratum with tarsi laying on its two sides and the head laid on the substrate laterally. At five-six day begging response appeared with the return of parents during feeding hours. The nestlings appears be able to recognize their parents and the parents seemed to recognize and feed only their youngs. At that stage nestlings continued begging for 20-40 seconds. At 13th or 14th day begging continue until food is received. However, food begging response ceases after 5-10 minutes. This scheme of begging continues irregularly and less vigorously until they are feed. Parents seem to feed the most active and stongest hatchling at first and then the others. Feeding of nestlings is discussed in the chapter on parental care.

Table 10.9 shows the age of first emergence and frequent occurence

of seven basic hatchling motor patterns in Little Cormorants and Night Herons. The seven basic motor patterns are standing on tarsii, wing flapping, preening and clearing, hopping around the nest, bouncing over the nest, flying around the trees and flying out of trees. From the data in clear that Night Herons performed all the activities 2-8 days earlier. It may be mentioned that Night Herons actually take more time to hatch out from the shell, i.e. approximately 2-3 days in comparison to Little Cormorants. Thus the contention that the phenomenon of altricial-precocial condition may be minimized if time is counted from the day of fertilization. However, the condition is heavily influenced by environmental compulsion and genetic capability.

Table 10.10 and 10.11 shows the dawdling movements Little Cormorants and Night Herons fledglings respectively in relation to age. It is seems that the Little Cormorants leave the nest for the first time around 28th day of hatching while the same is done by Night Heron fledglings on 26th day. Initially the 1st hatchling of Little Cormorants and Night Heron move only 27.00 cm. and 31.75 cm. respectively from the nest. The first hatchlings of the two species stay outside their nests for about 9 minutes on 28th day in case of Little Cormorant and 8 minutes in case of Night Heron on 26th day of hatching. Maximum distance travelled by nestlings and average time away from nest gradually decrease in the second and third hatchlings in both species. This pattern continues throughout the nesting period until the nestlings stay outside the nest and never return to the nest. This happens around 32nd to 35th day of hatching in case of Little Cormorant for all the hatchlings and 31st to 35th day of hatching in case of Night Herons. Around this time the parents of both species were observed to dismentale the nest. To induce the nestlings to be on their old. The parents probably also can not tolerate to bear the cost of parenting in further. Any further this, however, does not mean they discontinued al parental activities. They were observed to continue to feed their youngs and actively deter predation.

Table 10.1 : Hatching and fledging success at different phases of breeding season in Little Cormorant

Clutch Size	Year	Phases of breeding season								
		First Phase			Second Phase			Third Phase		
		Total no. of eggs	No. of successful fledglings	Success %	Total no. of eggs	No. of successful fledglings	Success %	Total no. of eggs	No. of successful fledglings	Success %
2	1996	00	00	00.00	80	50	62.50	40	20	50.00
	1997	06	03	50.00	00	00	00.00	12	06	50.00
	1998	06	03	50.00	02	01	50.00	8	05	62.50
	Total	12	06	50.00	10	06	60.00	24	13	54.16
3	1996	36	20	55.55	48	28	38.33	03	03	100.00
	1997	24	15	62.50	27	17	62.96	18	14	77.78
	1998	24	12	50.10	30	16	53.33	21	11	52.38
	Total	84	47	55.95	105	61	58.09	42	28	66.66
4	1996	64	33	51.56	44	29	65.90	36	25	69.44
	1997	24	14	58.33	20	14	70.00	24	17	70.83
	1998	52	32	61.53	24	14	58.33	24	13	54.16
	Total	140	49	56.42	88	57	64.77	84	55	65.47
5	1996	50	28	56.00	35	23	65.71	10	08	80.00
	1997	25	15	60.00	05	03	60.00	0	00	00.00
	1998	30	21	70.00	05	03	60.00	5	02	40.00
	Total	105	64	60.95	45	29	64.44	15	10	66.66
6	1996	18	08	44.44	24	15	62.50	0	00	00.00
	1997	12	07	58.33	00	00	00.00	0	00	00.00
	1998	06	02	66.66	06	02	33.33	0	00	00.00
	Total	36	07	52.77	30	17	56.66	0	00	00.00
Grand Total		377	213	56.49	278	170	61.15	165	106	62.24

Table 10.2 : Hatching and fledging success at different phases of breeding season in Night Heron

Clutch Size	Year	Phases of breeding season								
		First Phase			Second Phase			Third Phase		
		Total no. of eggs	No. of successful fledglings	Success %	Total no. of eggs	No. of successful fledglings	Success %	Total no. of eggs	No. of successful fledglings	Success %
2	1999	04	02	50.00	12	07	58.33	12	07	58.33
	2000	10	05	50.00	10	06	60.00	14	07	50.00
	2001	06	03	50.00	08	04	50.00	10	05	50.00
	Total	20	10	50.00	30	17	56.66	36	19	52.77
3	1999	54	30	55.55	63	38	60.31	36	20	55.55
	2000	81	43	53.08	87	46	52.87	48	23	47.91
	2001	72	40	55.55	75	41	54.66	24	15	62.50
	Total	207	113	54.58	225	125	55.55	108	58	53.70
4	1999	44	26	59.09	28	17	60.71	08	05	62.50
	2000	64	35	54.68	32	18	56.25	16	08	50.00
	2001	52	29	55.76	20	13	65.00	04	02	50.00
	Total	160	90	56.25	80	48	60.00	28	15	53.57
5	1999	15	07	46.66	00	00	00.00	00	00	00.00
	2000	10	05	50.00	10	04	40.00	05	03	60.00
	2001	10	04	60.00	05	03	60.00	00	00	00.00
	Total	35	16	45.71	15	07	46.66	05	03	60.00
Grand Total		422	229	54.26	350	197	56.28	177	95	53.67

Table 10.3 : Loss of eggs Hatchings and fledging success at different phases of breeding seasons in Little Cormorants

Phases of breeding cycle	Year	No. of egg	Egg loss					No. of hatchlings	Hatchling loss				No. of fledgling
			Predation	Rain/storm	Nest material stealing	Unhatched	Total		Starvation	Predation	Fall from the nest	Total	
1st	1996	168	26	13	5	17	61	107	11	4	3	18	89
	1997	91	7	6	2	10	25	66	4	5	3	12	54
	1998	118	8	8	3	12	31	87	5	4	8	17	70
	Total	377	41	27	10	39	117	260	20	13	14	47	213
			(10.87)	(7.16)	(2.65)	(10.34)	(31.03)	(68.96)	(5.30)	(3.44)	3.71)	12.46)	(56.49)
2nd	1996	159	11	11	5	15	42	117	10	4	3	17	100
	1997	52	2	2	0	8	10	42	5	2	1	8	34
	1998	67	3	5	1	10	19	48	4	3	5	12	36
	Total	278	16	18	6	33	71	207	19	9	09	27	170
			(5.75)	(6.47)	(2.15)	11.87	(25.53)	(74.46)	(6.83)	(3.23)	(3.23)	(9.71)	(61.15)
	1996	53	2	0	1	7	10	43	3	0	2	5	38
	1997	54	1	1	0	8	10	44	4	1	2	7	37
	1998	58	2	3	0	10	15	44	3	2	7	12	31
	Total	165	5	4	1	24	35	131	10	3	11	24	106
			(3.03)	(2.42)	(0.60)	(14.54)	(21.21)	(79.39)	(6.06)	(1.81)	(6.66)	(14.54)	(64.24)
Grand Total		820	62	49	17	96	223	598	49	25	34	98	489
			(7.56)	(5.97)	(2.07)	(11.70)	(27.19)	(72.92)	(5.97)	(3.04)	(4.14)	(11.95)	(59.63)

Table 10.4 : Loss of eggs hatchlings and fledging success at different phases of breeding season in Night Heron

Phases of the breeding cycle	Year	No of eggs	Egg loss					No of hatchlings	Hatchling loss				
			Predation	Rain / storm	Nest material stealing	Unhatched	Total		Starvation	Predation	Fall from the nest	Total	No. of fledglings
1st	1999	117	08	07	03	11	29	88	14	03	06	23	65
	2000	165	17	13	04	19	53	112	13	05	06	24	88
	2001	140	15	11	03	16	45	95	10	04	05	19	76
	Total	422	40	31	10	46	127	295	37	12	17	66	229
			(9.47)	(7.34)	(2.36)	(10.90)	(30.09)	(69.90)	(8.76)	(2.84)	(4.02)	(15.63)	(54.26)
2nd	1999	103	06	06	01	08	21	82	12	03	05	20	62
	2000	139	11	10	03	18	42	97	12	04	07	23	74
	2001	108	07	08	02	13	79	78	09	02	06	17	61
	Total	350	24	24	06	39	93	257	33	09	18	60	197
			(6.85)	(6.85)	(1.71)	(11.14)	(26.57)	(73.42)	(9.42)	(2.57)	(5.14)	(17.14)	(56.28)
3rd	1999	56	01	04	00	08	13	43	06	01	04	11	32
	2000	83	04	09	01	10	24	57	09	02	06	17	41
	2001	38	02	04	00	03	09	29	04	00	03	07	22
	Total	177	07	17	01	21	46	129	19	03	13	35	95
			(3.95)	(9.60)	(0.56)	(11.86)	(25.98)	(72.88)	(10.73)	(1.69)	(7.34)	(19.77)	(53.67)
Grand Total		949	71	72	17	106	266	681	89	24	48	161	521
			(7.48)	(7.58)	(1.79)	(11.16)	(28.02)	(71.75)	(9.37)	(2.52)	(5.05)	(16.96)	(54.89)

Table 10.5 : Clutch size and productivity in Little Cormorants

Year	Clutch Size	Total no. of eggs	Total no of nests	Total no of fledglings	Productivity (No. of fledglings / nests
1996 – 1998	2	46	23	25	1.08
	3	231	77	136	1.76
	4	312	78	191	2.44
	5	165	33	103	3.12
	6	66	11	34	3.09

Table 10.6 : Clutch size and productivity in Night Herons

Year	Clutch Size	Total no. of eggs	Total no of nests	Total no of fledglings	Productivity (No. of fledglings / nests
1999 – 2001	2	86	43	46	1.06
	3	540	180	296	1.64
	4	268	67	153	2.28
	5	55	11	16	1.45

Table 10.7 : **Growth in body weight, length and linear dimensions of four body parts in Little Cormorant Nestlings**

Age (Days)	Average weight (gm) ($\bar{X}$ + S.D.)	Average length of body (cm) ($\bar{X}$ + S.D.)	Average length of bill (mm) ($\bar{X}$ + S.D.)	Average length of wing (mm) ($\bar{X}$ + S.D.)	Average length of tarsus (mm) ($\bar{X}$ + S.D.)	Average length of tail (mm) ($\bar{X}$ + S.D.)
01	17.8 ± 3.30	9.32 ± 0.67	11.10 ± 0.09	29.50 ± 0.18	7.10 ± 0.11	0
03	39.8 ± 8.50	10.5 ± 1.20	14.0 ± 0.15	32.0 ± 0.21	9.0 ± 0.12	0
07	150.09 ±17.68	21.48 ±1.88	24.6 ± 0.18	96.5 ± 1.10	22.3 ± 0.16	9.5 ±0.21
14	352.0 ± 26.72	32.0 ± 2.40	30.7 ± 0.22	166.7 ± 1.86	29.0 ± 0.20	32.0 ± 0.42

Table 10.8 : **Growth in body weight, length and linear dimensions of four body parts in Night Heron Nestlings**

Age (Days)	Average weight (gm) ($\bar{X}$ + S.D.)	Average length of body (cm) ($\bar{X}$ + S.D.)	Average length of bill (mm) ($\bar{X}$ + S.D.)	Average length of wing (mm) ($\bar{X}$ + S.D.)	Average length of tarsus (mm) ($\bar{X}$ + S.D.)	Average length of tail (mm) ($\bar{X}$ + S.D.)
01	27.88±6.15	10.21±0.96	15.4±0.30	34.0±0.27	14.10±0.14	0.0
03	66.3±10.26	12.0±1.40	22.2±0.26	46.0±0.86	21.0±0.26	0.0
07	198.5±15.33	23.44±1.39	40.8±0.46	108.3±0.93	34.2±0.16	4.4±0.08
14	382.96±23.45	33.8±0.85	65.8±0.51	223.0±1.77	52.8±0.51	19.2±2.8

Table 10.9 : Behavioural development of the nestlings of Little Cormorants & Night Herons

Motor patterns	Approximate average age (in days) of nestlings when the pattern appear			
	First emergence		Frequent occurrence	
	Little Cormorant N =12	Night Heron N = 13	Little Cormorant N = 15	Night Heron N = 16
Standing on tarsi	16	13	20	18
Wing flapping	14	12	23	19
Preening and clearing	13	11	25	22
Hopping around the nest	25	17	28	23
Bouncing over the nest	28	21	32	29
Flying around the trees	33	30	42	38
Flying out of trees	45	38	50	45

Table 10.10 : Dawdling movements of fledglings of Little Cormorant in relation to age.

Days of hatchlings	1st hatchling (N=11)		2nd hatchling (N=14)		3rd hatchling (N=15)	
	Ave. Max movement distance from nest (cm)	Ave. time outside nest (m/hr)	Ave. Max. movement distance from nest (cm)	Ave. time outside nest (m/hr)	Ave. Max. movement distance from nest (cm)	Ave. time outside nest (m/hr)
28	27.00	8.33	17.50	5.00	13.50	7.83
29	47.00	21.67	35.00	15.00	28.50	14.17
30	95.00	50.00	60.00	36.67	37.50	20.00
31	100.00	60.00	77.50	33.00	55.00	35.00
32	105.00	55.00	97.50	25.00	81.50	45.75
33	115.00	60.00	120.00	60.00	85.00	50.00
34	140.00	60.00	145.00	60.00	117.00	55.00
35	185.00	60.00	165.00	60.00	149.00	60.00
36	225.00	60.00	210.00	60.00	200.00	60.00
37	260.00	60.00	245.00	60.00	240.00	60.00
38	375.00	60.00	335.00	60.00	310.00	60.00
39	472.00	60.00	450.00	60.00	420.00	60.00
40	550.00	60.00	520.00	60.00	470.00	60.00
41	580.00	60.00	560.00	60.00	510.00	60.00

Table 10.11 : Dawdling movements of fledglings of Night Herons in relation to age.

Days of hatchlings	1st hatchling (N=11)		2nd hatchling (N=14)		3rd hatchling (N=15)	
	Ave. Max movement distance from nest (cm)	Ave.time outside nest (m/hr)	Ave. Max. movement distance from nest (cm)	Ave. time outside nest (m/hr)	Ave. Max. movement distance from nest (cm)	Ave. time outside nest (m/hr)
26	31.75	8.00	19.05	6.00	16.08	4.00
27	43.18	14.00	27.86	16.65	20.16	15.00
28	57.50	33.00	42.38	22.00	28.12	24.00
29	76.20	50.00	68.54	38.00	38.10	34.00
30	92.44	55.00	102.40	43.00	55.88	38.00
31	167.64	60.00	152.40	50.00	82.00	46.00
32	198.12	60.00	160.22	55.00	120.00	50.00
33	213.36	60.00	182.88	60.00	168.00	52.00
34	280.52	60.00	210.22	60.00	187.00	55.00
35	335.28	60.00	245.84	60.00	254.00	60.00
36	410.20	60.00	365.76	60.00	320.00	60.00
37	457.00	60.00	410.00	60.00	380.00	60.00
38	535.00	60.00	490.00	60.00	420.00	60.00

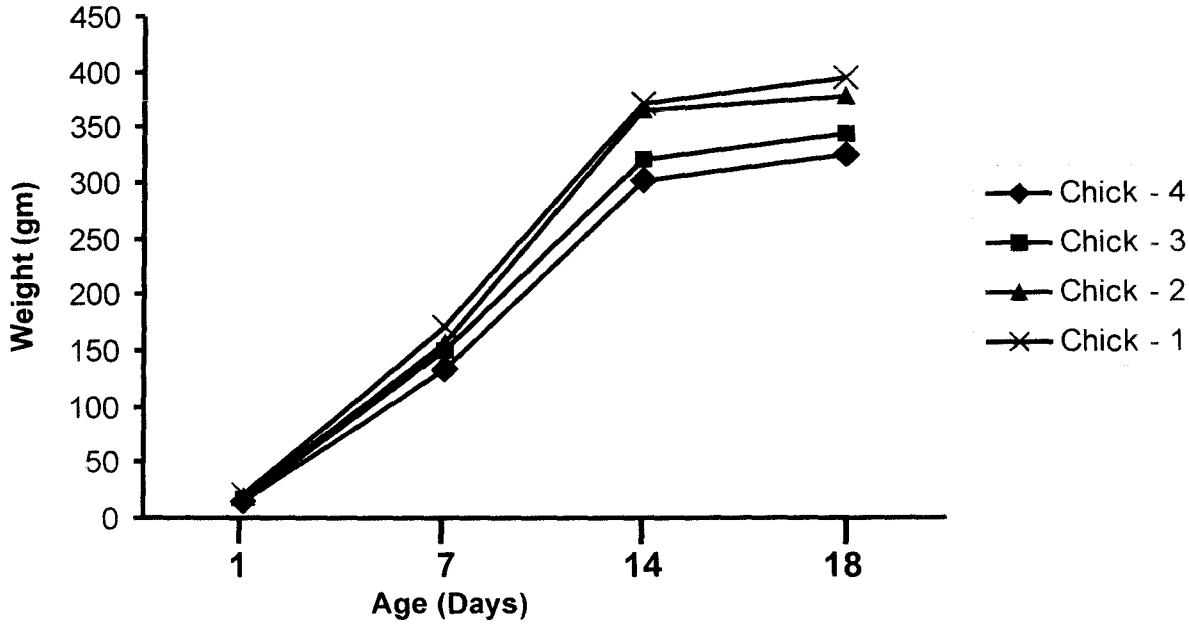

Fig. 10.1 : Weight gain of Little Cormorant nestlings according to their status in the brood

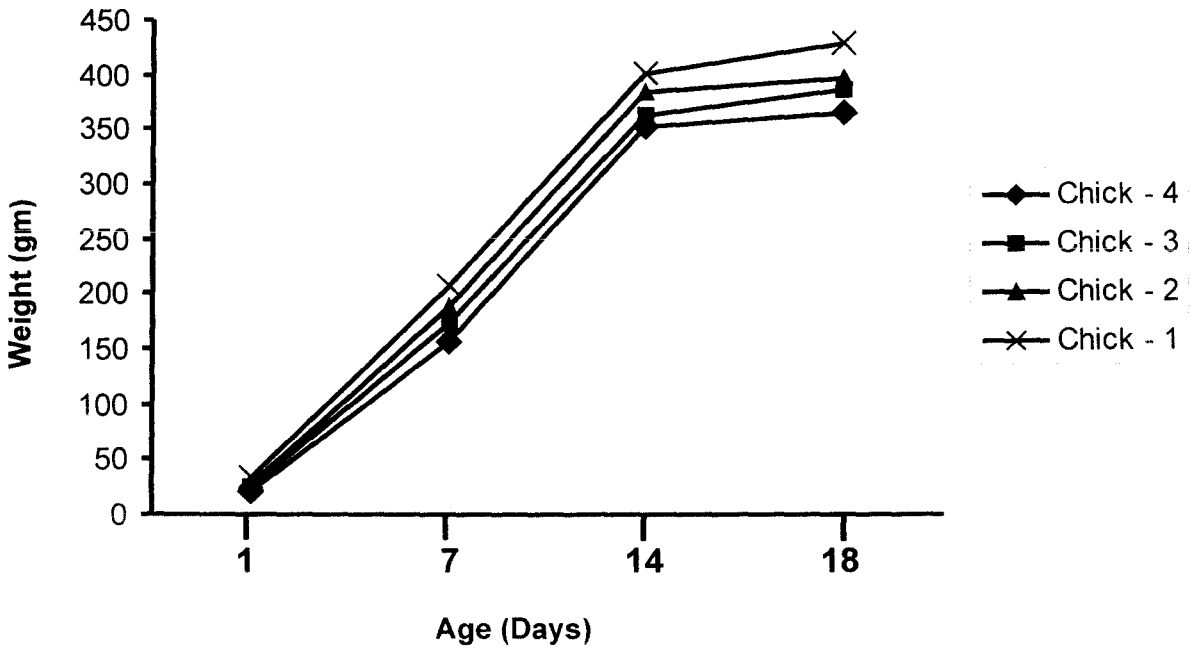

Fig. 10.2 : Weight gain of Night Heron nestlings according to their status in the brood

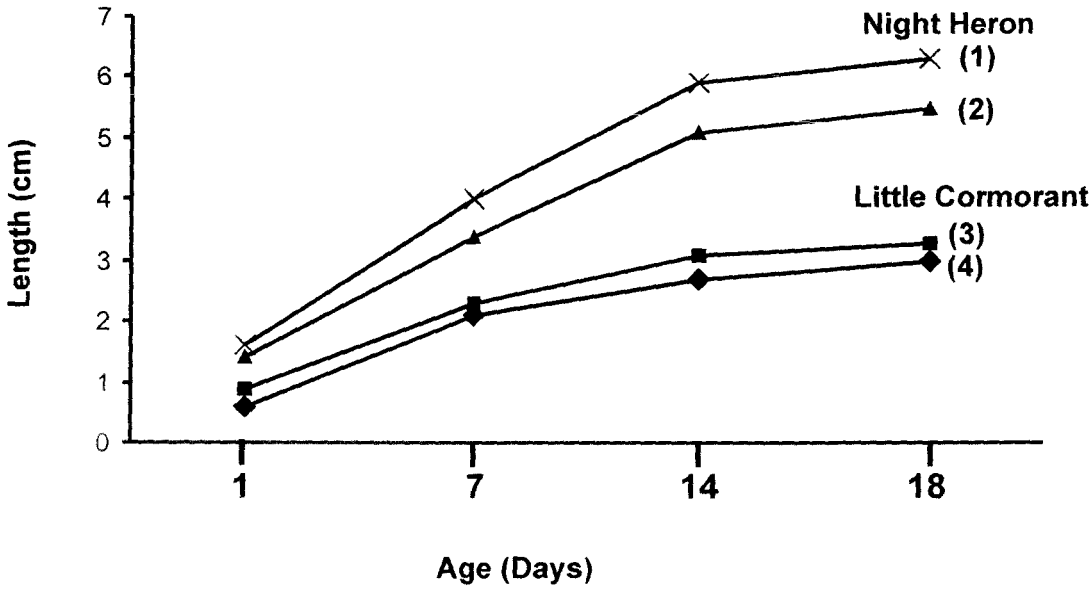

Fig. 10.3 : Tarsal growth of oldest (3 & 1) and youngest (4 & 2) nestlings of Little Cormorant and Night Heron.

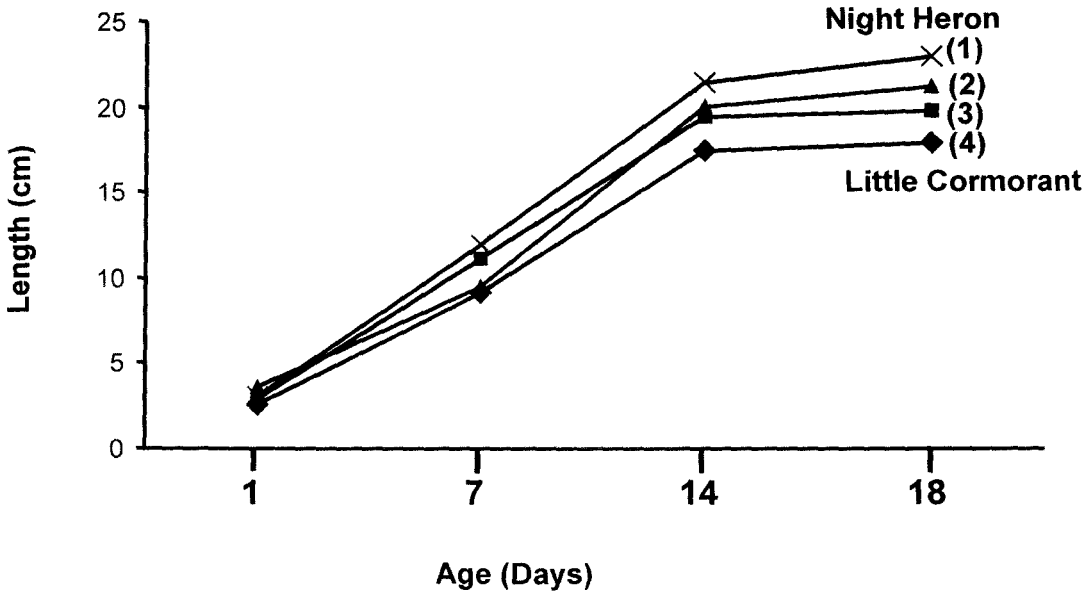

Fig. 10.4 : Wing growth of oldest (3 & 1) and youngest (4 & 2) nestlings of Little Cormorant and Night Heron.

Plate 10.1 House Crow in the sanctuary waiting for egg predation from the nest

Plate 10.2 An one-day and a fifth-day hatchlings of Little Cormorant in a nest.

Plate 10.3 A two-day hatchling of Little Cormorant.

Plate 10.4 A four-day hatchling of Little Cormorant.

Plate 10.5 A six-day hatchling of Little Cormorant.

Plate 10.6 Two Little Cormorant hatchlings at mid-hatchling phase

Plate 10.7(A) A Little Cormorant hatchling at post-hatchling phase

Plate 10.7 (B) Two Little Cormorant hatchlings at post-hatchling phase

Plate 10.8 A Night Heron hatchling resting just after emergence from the shell.

Plate 10.9 A three day Night Heron hatchling covered with luxurious down, open eyes.

Plate 10.10 Two Night Heron hatchlings at mid-hatchling phase, the dominant one with open-bill probably orienting to an incoming parent.

Plate 10.11 Two Night Heron hatchlings at late hatchling stage.

Plate 10.12 An early fledgling of Night Heron at post hatchling phase.

Plate 10.13 Two Night Heron fledglings after molting.

Plate 10.14 Food begging behavior of Little Cormorant hatchlings.

Plate 10.15 Self-preening of Little Cormorant hatchlings