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Growth of Various Morphometric Parameters of Red- Wattled Lapwing (*Vanellus Indicus*) at Junagadh City, Gujarat

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ABSTRACT

Breeding activity of Red-wattled lapwing is March up to August. It chicks fledged on an average at 35 to 38 days at Junagadh. Weight was the fastest growing parameter, which reached approximate to that of adult size in 34 days, wing and body length reaching approximately 90% of the adult size at the age of 38 days. Tail is reached 90% of asymptotic size within 33.21 days. Tarsus was acquired 90% of growth in 29.45 days and 90% of adult size in 28 days. Middle toe is the next parameter acquiring 90% of growth in 24.78 days and 90% of adult size in 35 days. Bill was the fastest growing parameter with a growth constant rate of 0.0425.

KEYWORDS Growth of red- wattled lapwing.

INTRODUCTION:-

The Red-wattled lapwing (*Vanellus indicus*) is classified as Least Concern on the IUCN Red List (2010).and is a member of the Charadriidae family. It is a precocial species widely distributed in the Indian subcontinent (Ali &Ripley 1987). The local name is "titodi" in Gujarati. It shows a preference for sites in close proximity to freshwater. It is a monogamous bird, breeds from March to August; eggs are laid in March to June in Junagadh; the average size of 100 eggs was 4.21 X 3.03cm (Patel and Dhandhukia, 2015). In this paper, we present aspects of growth and development of the Red-wattled Lapwing.

STUDY AREA:-

The study was confined to Junagadh city a District head-quarter and a picturesque town, which was the former capital of the Princely State of Junagadh. The Junagadh city is located between latitudes 21° 31'N and 70° 49' E. The city is a gate way to famous Gir Forest which is the natural habitat for the last existing population of Asiatic Lion in the wild. Jungadh has a tropical monsoon climate with three distinct seasons i.e., monsoon, winter and summer.

MATERIAL AND METHOD:-

The growth of various morph metric parameters of the nestling such as, tarsus, wing primary, bill, middle toe and tail were measured weekly using vernier calipers, divider and ruler (Ali and Ripley 2001- Vol.1). Each chick of a brood was individually marked using color plastic rings fitted in tarsus. Marking was also done at finger portion using permanent marker. Increments in growth of various body parts were plotted against age of chick (days) and growth curves were fitted using Gompertz growth equation (Ricklefs 1967) as mentioned below:

$$W_{(t)} = A_{exp} \{-exp [(-k (t-i))]\}$$

Here, W (t), is length (cm) at age t (days), A is the asymptote of growth curve (cm), i is the age at inflection point (days) and k is growth rate constant ($days^{-1}$).

Time required for growth from 10 to 90 % of asymptote ($t_{10\text{-}90}$) was also calculated for comparison of growth of different body parts using the formula given by Ricklefs (1967) as given below:

$$t_{10} - t_{90} = (C_{90} - C_{10}) / (dw/dt)$$

Where, C_{10} and C_{90} are conversion factors at 10% and 90% of asymptotic growth and slope of above mentioned curve dw/dt are the growth rate. Adult Red-wattled lapwing was capture during breeding season in March and April in its nest.

RESULTS AND DISCUSSION:-

Breeding activity of Red-wattled lapwing in the present study was March up to August. Weight was the fastest growing parameter, which reached approximate to that of adult size in 34 days, followed by wing and body length reaching approximately 90% of the adult size at the age of 38 days respectively (Table 1).

Saxena, *et. al.* (2013) indicate that the brooding mother kept freshly hatched young warm at night. During the day the male and both the female protected them from the hot sun taking turns.

Comparison of ratio of size at weight at fledgling to adult size showed that Red-wattled lapwing remained relatively under developed at fledgling stage. This affect the fledgling time, as the Red-wattled lapwing chicks fledged on an average at 35 to 38 days, a hypothesis in this context, proposed from the observation is, Red-wattled lapwing had adapted themselves to the urban landscape and city area. Thus a chance of predation increases several folds both to adult and fledglings in Red-wattled lapwing, thus fledgling time can be considered as anti-predatory tactics, to ensure the future of the species.

The growth of chicks is influenced by various intrinsic and extrinsic factors (Ricklefs 1968, 1973). Within a brood, hatching order influences the growth rate. Asynchronous hatching produces initial size differences among brood members. Due to that a general hierarchy in growth is observed, in which the senior most chick achieves faster growth than the juniors (Zach 1988).

Beginning (1 to 12 days) the tail is fur like: but it reached 90% of asymptotic size within 33.21 days. It reached 90% of adult size in 35 days of age which is almost the fledgling time. Tarsus was next to tail in growth and it acquired 90% of growth in 29.45 days and 90% of adult size in 28 days (Table 1). Maturation of structures associated with flight (i.e., tail and wing) was relatively slow, but soon reached at 90% of adult size after fledgling. This further provides evidence for addictiveness of differential maturation of body components as it has little function until fledgling. Tail growth began later

and proceeds faster than wing but reached at similar stage of development at the time of fledgling as both are essential for flight in Common Myna (Dhandhukia 2014).

Middle toe is the next parameter acquiring 90% of growth in 24.78 days and 90% of adult size in 35 days. Bill was the fastest growing structure with a growth constant rate of 0.0425 (Table 1). Thigh, Tarsus and bill which reached 90% of adult size in 25, 28, 27 days that indicate that this morph metrical part is fast growth and reached fast at 90% adult size than other morph metrical part. Growth rate of bill, tarsus and thigh was slow in Common Myna (Dhandhukia 2014), but in Red-wattled lapwing growth rate of bill, tarsus and thigh was fast; this data reviled that. helped them to run with their parents and feed on their own; Long Tarsus and middle toes of the chicks help them to run to feeding grounds with their parents and feed on their own, the well developed tarsus, middle toe and bill are very effective in their run-peck and probing types of feeding habitat. This is probably an edition for chick survival in the ground nesting.

Agriculture has been determined as the important factor in survival of ground nesting birds such as Red-wattled lapwing. Some positive as well as negative effects of the agriculture activities were observed. (Narwade *et. al*. 2010).

The measurement of growth parameters data reviled that age of one day old chick has an average weight of 11.2g. and their body length 65.6 mm, bill length 12.00 mm, tarsus 18.2 mm, middle toe 15.00 mm are there and one day chick have wing 24.1 mm, whereas tail is fur like 18.9 mm.

Similarly for ten day old chick weight increases 11.2g to 17.24g.this indicate that body weight of chicks increased very slowly for the first seven days after hatching but after that period Body weight of chicks increased very fast. That same way growth rate of body length 65.6 mm increases to 108.8 mm, means that growth is 43.2 mm respectively. In wing growth during 10th day increases 24.1 mm into 33.1 mm, meaning that wing growth is 9.00 mm during 10th day chick. Tail growth during 10th day increases 18.9 mm into 23.9 mm, meaning that wing growth is 5.00 mm. Mean growth rate of the Red-wattled Lapwing till flcdging at 38 days was 2.44 ± 0.01 gm/day (Kalsi and Khera, 1990). Jackson & Jackson (1980) reported mean growth rate of 3.26 ± 1.48 gm/day in the Northern Lapwing. During 20 to 25 day growth of body weight, body length, bill, tarsus, middle toe does not vary significantly. During 25th day weight 30.1g, body length 168.6 mm, bill length 26.00 mm, tarsus length 32.5 mm, middle toe length 31.8 mm, wing length 46.1 mm, tail length 39.1 mm are found. Bill length is 100% in 25th day, tarsus is 100% in 32th day and middle toe is 100% in 35th day. The growth rate of wings and remiges was faster than that of the beak and tarsi, and the rate of increase in body-weight (Kalsi and Khera, 1990) We too are satisfy with work of Kalsi and Khera, 1990. The Red-wattled Lapwings attained a capability of free flight, i.e. were fledged at an age of 38 days and weighed 106.5 gm (mean). As the aerial flight enables a bird to effectively avoid terrestrial predators, rapid development of wing and remiges while gaining weight at a slower rate, confers an early and effective wing loading capability (Redfem1983). In the present study the growth of chicks of Red-wattled lapwing is thoroughly investigated.

Table 1 Growth parameters of Red wattled lapwing.

S.N.	Body part	Growth constant (k)	Asymptotic size A (mm)	t_{10-90} (days)	Age at 90% of adult size (days)	Ratio of size at fledgling to adult size
1	Body length	0.3421	259.1	27.31	38	0.98
2	Bill	0.0425	30	31.68	27	0.92
3	Tarsus	0.1241	40	29.45	28	0.89
4	Thigh	0.2451	40	30.57	25	0.75
5	Middle toe	0.1022	39.6	24.78	35	1
6	Wing	0.3251	72.5	32.86	38	0.99
7	Tail	0.3541	53.1	33.21	35	0.89
8	Weight	0.5242	929.1	22.16	34	0.87

Table 2 Morph metrical measurement of adult male and female of Red wattled lapwing.

Sex	Body length (mm)	Bill (mm)	Tarsus (mm)	Middle toe (mm)	Wing (mm)	Tail (mm)	Weight (g)
Male (N=5)	310.0	35.7	74.0	36	180.1	98.9	176.83
Female (N=6)	296.0	32.7	69.4	34.5	172.4	97.5	166.54

REFERENCES

Ali, S., and Ripley, D. (2001). Handbook of Birds of India and Pakistan. Vol.1 & 5.Oxford Univ. Press, Bombay. Bird Life International. Vanellus indicus. In: IUCN (2010). IUCN Red List of Threatened Species. Dhandhukia, S.N. (2014). Growth of various morphometric parameters of the nestling in Common Myna (Acridotheres tristis). Int. J. of Scientific Research.3 (5): 566-568. Desai, J. H; Malhotra, A. K (1976). "A note on incubation period and reproductive success of the Redwattled Lapwing, Vanellus indicus at Delhi Zoological Park". J. Bombay Nat. Hist. Soc. 73 (2): 392–394. Jackson, R. & J. Jackson, (1980). A study of Lapwing breeding population changes in the New Forest, Hampshire. Bird Study 27: 27-34. Kalsi, R.S. & S. Khera, (1990). Growth and development of the Red-wattled lapwing Vanellus indicus. Stilt 17: 57–64. Kalsi, R.S. & S. Khera, (1986). Some observations on breeding and displacement behaviour of the Red-wattled Lapwing, Vannellusindicusindicus (Aves: Charadriidae). Res. Bull (Sci.) of the Panjab University. 37: 131-141. Lack, D. 1968. Ecological Adaptations for Breeding in Birds. London: Methun. Patel, K.B. and Dhandhukia, S.N. (2015). Egg Dimension and Egg Weight loss During Incubation of red- Wattled Lapwing (Vanellus Indicus) at Junagadh city, Gujarat. Indian j. of Applied Research. 5 (5):19-20. Redfern, C.P.F 1983. Aspects of the growth and development of Lapwing Vanellusvannellus. Ibis 125: 266-272. Richards, F.J. 1959. A flexible growth functions for empirical use. J. Exp. Bot. 10: 290-300. Ricklefs, R. E. (1967). Graphical method of fitting equation to growth curves. Ecology 48: 978-983. Ricklefs, R. E. (1968). Patterns of growth in birds. Ibis 110: 419-451. Saxena, V. L. and Saxena, A. K. (2013). The Study of Nidification Behavior In Red Wattled Lapwings, Vanellus indicus. Asian J. Exp. Sci., 27(2): 17-21. Zach, R1988. Growth-curve analysis: A critical roovanlumtion .Auk 105: 208-210.