

Clutch size, laying date and reproductive success of Little Cormorant

B. C. PAL and A. K. DAS

Department of Zoology, University of North Bengal
Darjeeling 734430, India.

ABSTRACT

Clutch size, laying date and reproductive success of little cormorant *Phalacrocorax niger* (Vieillot) were studied in the Kulick Bird Sanctuary, Raiganj, Uttar Dinajpur, West Bengal. Observations were made mostly in the morning and afternoon hours except on holidays. Clutch size of little cormorant varied from two to six. The most common clutch size was four and broods of five were most productive. Mean clutch size declined with the advancement of season. Fledging success was lower early in the season due to intense competition and adverse environmental conditions. The present study contradicts Lack's (1947, 1954) arguments.

Key words : Clutch size ; Fledging success ; Nest predation ; Reproduction.

INTRODUCTION

Most models of evolution of clutch size and life history strategies of birds and other organisms (Godfrays, 1987 ; Lloyd, 1987 ; Morris, 1982 ; Risch *et al.*, 1996) are heavily influenced by Lack's (1947, 1954) arguments that among altricial birds clutch size corresponds to the maximum number of hatchlings that parents can feed and rear. However, in many bird species Lack's prediction does not hold. Clutch size actually represents a trade off between current and future reproduction, with birds producing fewer, higher-quality offsprings in the current year while increasing their chances of survival and reproduction in the next year. This at present appears to be the most acceptable explanation but deviates substantially from Lack's prediction (Nur, 1988 ; Stearns, 1992 and Vander Werf, 1992).

STUDY AREA

The Kulick Bird Sanctuary extends over 130.09 ha. The nesting zone, however, spans over an area of about 16 ha. This includes a tongue-shaped island, which is encircled by a man-made canal with perennial water. Although little cormorants inhabit along with five other bird species, namely two species of egrets, two species of herons and open-bill stork in the sanctuary ; their nesting activity is predominantly concentrated in the island. The existence of the birds in the sanctuary is recorded since 1975. The sanctuary is only 2 km northwest of Raiganj town (25°36'

N, 38°10' E). Data were collected from June to January in 1996-97 and 1997-98. Most part of the nesting area was covered by a mixed vegetation of *Lagerstromia flosregnae* and *Barringtonia acutangula* which together constituted 87% of the tree species population in the sanctuary.

MATERIALS AND METHODS

During the study period a total of 154 nests of little cormorant *Phalacrocorax niger* (Vieillot) were observed from a 10m high bamboo 'machan' (platform) suitably built in the island, roof of the Rest House, some suitable spots on the ground, from the nesting trees and from the adjacent trees without nests. Normally visitors are not allowed to the island. A paddle-boat was used by the investigators to get to the island and to the 'machan' from where most of the observations were made. The nesting trees were below the "machan", so looking into the nest was possible. To begin with, the birds showed alarm response to the investigators while getting on the "machan" or climbing trees by moving away from the nest to a nearby tree but after a few days they got habituated to the condition and there was little or no response from the birds.

The usual observation schedule was 0600 to 0900 hours and 1500 to 1800 hours. On Sunday and other holidays, however, observations were taken throughout the day.

The nests were inspected daily during the egg-laying and hatching periods. Efforts were taken to complete

Table 1. Clutch size and fledging success at different phases of breeding season.

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	1996-97	0	0	0	8	5	62.50	4	2	50
	1997-98	6	3	50	0	0	0	12	6	50
	Total	6 (3)	3	50	8 (4)	5	62.50	16 (8)	8	50
3	1996-97	36	20	55.55	48	28	38.33	3	3	100
	1997-98	24	15	62.50	27	17	62.96	18	14	77.78
	Total	60 (20)	35	58.33	75 (27)	45	60	21 (7)	17	80.95
4	1996-97	64	33	51.56	44	29	65.90	36	25	69.44
	1997-98	24	14	58.33	20	14	70	24	17	70.83
	Total	88 (22)	47	53.40	64 (16)	43	67.18	60 (15)	42	70
5	1996-97	50	28	56	35	23	65.71	10	8	80
	1997-98	25	15	60	5	3	60	0	0	0
	Total	75 (15)	43	57.33	40 (8)	26	65	10 (2)	8	80
6	1996-97	18	8	44.44	24	15	62.50	0	0	0
	1997-98	12	7	58.33	0	0	0	0	0	0
	Total	30 (5)	15	50	24 (4)	15	63.50	0 (0)	0	0
Grand Total		259	143	55.21	211	134	63.50	107	75	70.09

The figures in the parentheses indicate number of clutches

inspection as quickly as possible in a way so as to make negligible disturbance to the birds and hatchlings. The progress and development of all the nests were followed until the last young left the nest. Binoculars (7-15 × 35 with zoom) were used whenever required. It was observed that the female partners laid the first egg within one or two days on completion of the floor and partially the rim of the nest. However, both the partners continually added nest materials to the nest until the fledglings fly out of the nest. The eggs were numbered along with the date with a marker pen soon after laying and the process was continued until the last egg was laid. Thus the clutch size for each pair was determined. The nesting trees and all the nests in each tree were also marked. The incubation phase generally extends over 23 to 24 days. Only the nests which were occupied by a nesting pair and those that were not damaged, destroyed or deserted during the laying phase were considered in the study.

The laying period was divided into three phases: early, median and late (i.e. from 10th July to 9th August, 10th August to 9th September and 10th September to the date of last laying respectively). Clutch size was divided into four classes (i.e. very small (clutch of 2), small (of 3), medium (of 4) and large (of 5 to 6)). The ability of the hatchlings to fly across the trees away from the nests was considered to be successful fledging. This situation was usually observed at about 4 weeks after hatching.

Egg disappearance factors were identified according to the following assumptions. In case of egg predation, the predator which in 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. Thus no traces of egg-shells are found beneath the nest. Disappearance due to storms or rains were detected by inspection of the nests and the ground beneath for dropped eggs within 12-15 hours of the storm. Detection of dropped eggs on the ground under the nest in absence of rain or storms was taken to be due to poaching of nest materials by other birds. The unhatched eggs on the other hand are maintained and incubated in the nest for 3-8 days following hatching of all the other eggs. Those finally, however, are rejected by the parents and are dropped from the nest.

In case of death of hatchling due to starvation the dead body of the hatchling remains in the nest. Disappearance

of hatchlings from the nest and absence of the carcass on the ground beneath were taken to be due to predation which as in the case of eggs was mainly done by crows. In death of hatchlings due to fall from nest fresh dead bodies of hatchlings were detected beneath the nest during routine inspection.

RESULTS

Birds of both sexes start arriving in the sanctuary from the last week of June (25th June in 1996 and 29th June in 1997). Generally, little cormorants prefer to assemble at the top branches of Jarul trees (*L. flosregnae*) which are free from nests. In about a couple of days the males try to attract the attention of the females by emitting calls and visual displays. The females on the other hand watch the males from a distance of about 1.5m and move from male to male. Ultimately a female approached very close (15cm) to a male and mate selection is completed in about 3-4 days following arrival. The pair then hops from spot to spot usually in the same tree apparently looking for a suitable nest-site. They usually select a point where the stem bifurcates or trifurcates as the nesting site. After nest site selection the nest building activity starts around the first week of July. At the outset the floor of the nest is constructed. When the rim of the cup-shaped nest is prepared at least partially, the female occupies it and start laying eggs.

Laying starts from the second week of July. The first egg was observed on 8th and 12th July in 1996 and 1997 respectively. A considerable degree of variation was observed in clutch size in the different phases of the prolonged egg laying period.

Table 1 shows that out of 65 clutches in the first phase 4.61% were very small, 30.77% were small, 33.85% of medium size and 30.77% of large size. Similarly, of the 57 clutches in the second phase and 32 of the third phase the percent distribution in the very small, small, medium and large categories were 7.02, 43.86, 28.07 and 21.05; and 25.00, 21.87, 46.87 and 6.25 respectively.

Clutch size varied from 2 to 6 with a frequency distribution of 15 clutches of 2 (9.74%), 52 clutches of 3 (33.77%), 53 clutches of 4 (34.41%), 25 clutches of 5 (16.23%) and 9 clutches of 6 (5.84%). The overall mean clutch size was 3.75 ± 0.5 ($n = 154$). The mean clutch size

Table 2. Loss of eggs, hatchlings and fledging success at different phases of breeding season.

Phases of the Breeding Cycle	Year	No. of eggs	Egg loss					No. of hatchlings	Hatching loss				No. of fledglings
			Predation	Rain / storm	Nest material stealing	Unhatched	Total		Starvation	Predation	Fall from the nest	Total	
1 st	1996-1997	168	26	13	5	17	61	107	11	4	3	18	89
	1997-1998	91	7	6	2	10	25	66	4	5	3	12	54
	Total	259	33	19	7	27	86	173	15	9	6	30	143
			(12.74)	(7.33)	(2.70)	(10.42)	(33.20)	(66.79)	(5.79)	(3.47)	(2.32)	(11.58)	(55.21)
2 nd	1996-1997	159	11	11	5	15	42	117	10	4	3	17	100
	1997-1998	52	2	0	0	8	10	42	5	2	1	8	34
	Total	211	13	11	5	23	52	159	15	6	4	25	134
		(6.16)	(6.16)	(5.21)	(2.23)	(10.90)	(24.64)	(75.35)	(7.11)	(2.84)	(1.89)	(11.85)	(63.50)
3 rd	1996-1997	53	2	0	1	7	10	43	3	0	2	5	38
	1997-1998	54	1	1	0	8	10	44	4	1	2	7	37
	Total	107	3	1	1	15	20	87	7	1	4	12	75
		(2.80)	(2.80)	(0.93)	(0.93)	(14.02)	(18.69)	(81.31)	(6.54)	(0.93)	(3.74)	(11.21)	(70.09)
Grand Total		577	49	31	13	65	158	419	38	15	14	67	352
			(8.49)	(5.37)	(2.25)	(11.26)	(27.38)	(72.62)	(6.58)	(2.60)	(2.43)	(11.61)	(61.00)

The figures in the parentheses indicate percentage

in the first, second and in the third phase was 3.98, 3.70 and 3.02 respectively.

Out of a total of 577 eggs studied, overall fledging success increased as the laying date progressed. It was 55.21% in the first phase, 63.50% in the second and a maximum of 70.09% in the third phase. Table 1 shows that this is the general trend for all the clutch size categories except for the clutch of 2.

It was observed that both number of eggs and number of clutches declined as the laying season progressed. Number of eggs declined from 259 in the first phase to 211 in the second and 107 in the third. Similarly, number of clutches were 65, 57 and 32 in first, second and third phases respectively. The data indicates that older mature birds laid more in the first phase whereas younger first-time breeders laid more in the subsequent phases.

Table 2 shows the main factors responsible for loss of egg, hatchling, and success of hatching and fledging. Predation accounted for maximum (12.74%) egg loss in the first phase but subsequently declined to 2.80% 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 10.42% in the first phase to 14.02% in the third phase. On the whole 72.62% eggs hatched to viable hatchlings.

The main factors for hatchling loss are starvation, predation and fall from the nest. Out of these factors starvation was responsible for maximum loss, accounting for 6.58% on the whole. Predation and fall from the nest on the other hand accounted for 2.60 and 2.43 percent respectively. Overall 61.00% eggs mature to successful fledglings.

DISCUSSION

It is evident from the study that clutch size declines with the advancement of the season. Similar observations were made in the Little Blue heron (Rodgers, 1980), in Black-crowned Night heron (Custer *et al.*, 1983), in precocial birds (Winkler and Walters, 1983), in Great Blue heron and Great egrets (Pratt and Winkler, 1985). Early clutches, however, were less successful than later ones. Wolford and Boag (1971) and Custer *et al.* (1983) obtained identical data in Black-crowned Night herons. Mean clutch

size on the other hand declined with the advancement of season. A significantly high percent (25.00%) of pairs in the third phase opted for clutches of 2. This unmistakably points out to the fact that a large proportion of the third phase breeders were young first time breeders or physiologically incapable to go for higher clutch sizes. The data supports the contention that small clutch size and prolonged parental care have evolved to avoid complete reproductive failure due to physiological and environmental stress conditions.

The most common clutch size was four and the broods of five were the most productive. 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).

It was found that number of unhatched eggs increased as the breeding season progressed while mortality due to other factors such as predation, fall due to rain / storm and fall due to stealing of nest materials decreased 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, competition 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 eggs by crows has been reported for various bird species (Baker, 1940; Picozzi, 1975; Verbeek, 1982; Salathe, 1987).

Loss of hatchlings was highest due to starvation probably for two reasons: one is behavioural and the other ecological. It is a well known fact that there is intense competition among hatchlings to obtain most feedings from the parents right 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 reason on the other hand is shortage of food material. It is seen that starvation death is highest in the second phase probably because of the fact that number of hatchlings in the second phase on the whole is highest. It may be mentioned that the hatchling period extends over a period of four 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 more predominant 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 may be 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 paucity of nest materials which need to be added to the nest throughout the nesting period.

Fledging success increased as the season progressed 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. This was also observed in Open-bill stork (Datta and Pal, 1990)

ACKNOWLEDGMENTS

The authors are thankful to Mr. P. K. Mitra, D. F. O. in-charge of Kulick Bird Sanctuary, Raiganj and Mr. Sujit Chakraborty, Beat Officer of Raiganj Beat and other staff members of Kulick Bird Sanctuary for their kind help during the course of study. The authors are also grateful to Prof. D. C. Deb, Head, Department of Zoology, University of North Bengal for logistic support

LITERATURE CITED

- Baker, R. H.** (1940). Crow predation on heron nesting colonies. *Wilson Bull.*, **52** : 124-125
- Custer, T. W., Hensler, G. L. and Kaiser, T. E.** (1983). Clutch size reproductive success, and organochlorine contaminants in Atlantic coast Black crowned Night herons. *Auk*, **100** : 699-710.
- Datta, T. and Pal, B. C.** (1990). Clutch size, laying date and reproductive success of Open-bill Stork. *Environment and Ecology*, **8** : 368-373.
- Godfray, H. C.** (1987). The evolution of clutch size in parasitic wasps. *American Naturalist*, **129** : 221-233.
- Klomp, H.** (1970). The determination of clutch size in birds. A review. *Ardea*, **58** : 1-124.
- Lack, D.** (1947). The significance of clutch size. *Ibis*, **89** : 302-352.
- Lack, D.** (1954). *The Natural Regulation of Animal Numbers*. Clarendon Press, Oxford, England.
- Lloyd, D.** (1987). Selection of offspring size at independence and other size versus number strategies. *American Naturalist*, **129** : 800-817.
- Morris, D. W.** (1992). Optimum brood size : Test of alternative hypotheses. *Evolution*, **46** : 1848-1861.
- Nur, N.** (1988). The consequences of brood size for breeding of Blue Tits. III. Measuring the cost of reproduction : survival, future fecundity, and differential dispersal. *Evolution*, **42** : 351-362.
- Perrins, C. M. and Moss, D.** (1975). Reproductive rates in the Great Tit. *Journal of Animal Ecology*, **44** : 695-706.
- Picozzi, N.** (1975). Crow predation on marked nest. *J. Wildl. Managt.* **39** : 151-155.
- Pratt, H. M. and Winkler, D. W.** (1985). Clutch size, timing of laying and reproductive success in a colony of Great Blue herons and Great egrets. *Auk*, **102** : 49-63.
- Risch, T. S., Dobson, F. S. and Murie, J. O.** (1996). Is mean litter size the most productive? A test in columbian ground squirrels. *Ecology*, **76** : 1643-1654.
- Rodgers, J. A.** (1980). Breeding ecology of the little blue heron on the West Coast of Florida. *Condor*, **82** : 164-169.
- Salathe, T.** (1987). Crow predation on loot eggs : effects of investigator disturbance, nest cover and predator learning. *Ardea*, **75** : 221-229.
- Stearns, S. C.** (1992). *The Evolution of Life Histories*. Oxford University Press, Oxford, U. K.
- Vander Werf, E.** (1992). Lack's clutch size hypotheses : an examination of the evidence using meta-analysis. *Ecology*, **73** : 1699-1705.
- Verbeek, N. A. M.** (1982). Egg predation by north-western crows : its association with human and bald eagle activity. *Auk*, **99** : 347-352.
- Winkler, D. W. and Walters, J. R.** (1983). The determination of clutch size in precocial birds. *Current Ornithology*, **1** : 33-68.
- Wolford, J. W. and Boag, D. A.** (1971). Distribution and biology of Black crowned Night herons in Alberta. *Canadian Field Naturalist*, **85** : 13-19.

Revised : 3 October 2002

Accepted : 29 October 2002

IV O-17. Parental Feeding Behaviour in Little Cormorant, *Phalacrocorax nigripennis* (Vieillot) in Kulick Bird Sanctuary, Raiganj, Uttar Dinajpur, West Bengal

A.K. DAS and B. C. PAL

Department of Zoology, University of North Bengal, Raja Rammoohanpur, Siliguri 734430

Little Cormorants are one of the six avian species that inhabit the Kulick Bird Sanctuary. Parental season starts from July and continues upto January. Both parents participate in feeding of the young. Usually the parents regurgitate food materials into the mouth of the early chicks, but the grown-up ones pick up food items from the open mouth of the parents. Occasionally the parents store some food items in the nest itself for consumption of the grown-up-chicks. Parental feeding continues even after fledging usually at the spots where the fledglings venture to move. Feed composition was obtained through analysis of regurgitations of the chicks who actually vomit when disturbed. Besides feed items stored by the parents in the nest were also considered. Frequency of feeding at different hours of the day and in different stages of chick-development were analyzed. Foraging duration, frequency and area covered in relation to chick-development were also considered. The growth rate of early chicks upto seven days age in terms of body weight were also determined.

University of North Bengal

Department of Zoology



National Symposium On "Assessment and Management of Bioresources"

May 29-30, 2003

In Association with the Zoology Society, Calcutta



Chief Patron:
Prof. P. C. Saha,
Vice-Chancellor,
University of North Bengal

Executive Committee:
Dr. J. R. B. Adhya
Instructor, ZSI
Dr. M. Bishadpur
Director, B.S.I.
Dr. A. Ghosh
Ex-Director, Z.S.I.
Prof. A.K. Chakravarty,
University of North Bengal
Prof. D.C. Das,
University of North Bengal

Jt. Convenors:
Dr. T.K. Chaudhuri
University of North Bengal
Dr. P. C. Saha, Z.S.I.

Organizing Secretaries:
Dr. S. Basu,
University of North Bengal
Prof. A. Mukherjee,
University of North Bengal

Finance Sub-Committee:
Dr. J. Pal,
University of North Bengal
Dr. T.K. Chaudhuri,
University of North Bengal

Correspondence
Sub-Committee:
Prof. A. Mukherjee,
University of North Bengal
Dr. M. Bishadpur,
University of North Bengal
Dr. Gautam Saha, ZSI.

Accommodation and
Refreshment:
Prof. A. K. Chakravarty,
Dr. S. Basu.

Scientific and Publication
Sub-Committee:
Prof. B. C. Pal
Prof. D.C. Das
Dr. M. Bishadpur

Abstracts:
Dr. S. Basu
Dr. T.K. Chaudhuri

CERTIFICATE

Certified that Shri / Smt./Ms. / Dr./Prof. A. K. Das

of Department of Zoology, University of North Bengal,
Raja Rammoohanpur, Siliguri attended the Symposium and
presented a paper entitled Parental Feeding Behaviour in
Little Cormorant, Phalacrocorax nigripennis (Vieillot) in
Kulick Bird Sanctuary, Raiganj, Uttar Dinajpur,
West Bengal

on 29.05.03

R.C. Basu
Convenor

T.K. Chaudhuri
Convenor

Biodiversity in avian populations in the Raiganj Wildlife Sanctuary West Bengal, India.

A.K. Das & B.C. Pal

CP-13

Department of Zoology, University of North Bengal
Darjeeling 734013, India.

ABSTRACT

Six migratory bird species nest and breed in the Raiganj Wildlife Sanctuary, Uttar Dinajpur, West Bengal. Their arrival time, morphological features, habitat preference, nesting date and structure, food items and population sizes were studied. The vegetation structure particularly tree species, fauna both aquatic and terrestrial species, soil composition at different spots within the sanctuary were analysed. The six species of birds successfully nest and reproduce within the sanctuary due to effective niche segregation. The situation is similar to the study site of Robert MacArthur in the Boreal Forest of New England, U.S.A. in late nineteen fifties.

Phone: (03523) 242570, Fax: (03523) 242580
e-mail: principalmandal@sancharnet.in



UGC - Sponsored Two-day Seminar on Environment & Sustainable Development, Nov 10-11, 2006

Raiganj College (University College), P.O. Raiganj - 733134, Uttar Dinajpur, West Bengal

Organising Committee

Prof. P.K. Saha, Vice-Chancellor, N.B.U. - Patron

Prof. R. Ghosh, Distt. Faculty of Arts, Commerce & Law, NBU - Vice Patron

Prof. B.N. Chakraborty, Dean Faculty of Science, NBU - Vice Patron

Dr. T.K. Chatterjee, Registrar, NBU - Vice Patron

Dr. P.K. Mandal, Principal, Chairman

Dr. U.N. Das, Sr. T. Majumdar, Dr. S. Chowdhury,

Dr. A.K. Ghosh, Smt. S. Das, Dr. D. Desai, Dr. C. Basu, Head of the Dept. Physics,

Dr. P. Ghosh, Head of the Dept. Chemistry

Smt. J. Das, Head of the Dept. Zoology

Dr. B.K. Sanyal, Head of the Dept. Mathematics

Sri T.K. Basu, Head of the Dept. Commerce

Dr. V. Agarwala, Head of the Dept. Geography

Dr. S. Roy Chowdhury, Head of the Dept. Bengali

Sri S. Dasgupta, Head of the Dept. English

Smt. K. Chatterjee, Head of the Dept. Philosophy

Sri B. Giri, Head of the Dept. History

Mr. S. Sinha, Head of the Dept. Political Science

Dr. P. Mahala, Head of the Dept. Sanskrit

Sri K.C. Mandal, Librarian

Dr. N. Roy, Secretary T.C.

Sri B.K. Goswami, Secretary, F.A.

Sri Sanjay Paul, G.S., Student Union

Sri Saha, Head of the Dept. Economics

Reception: Dr. U.N. Das, Dr. A.K. Ghosh,

Dr. Vidyawati Agarwala

Smt. Shashi Das, Dr. Nirmal Roy

Floor Liaison: Dr. C. Basu, Dr. P.K. Ghosh,

Dr. A. Bhatia

Abstract: Dr. A. Bhatia, Dr. P.K. Ghosh,

Sri Kabirish Mandal

Accommodation: Sri T. Majumdar,

Dr. A. Ghosh,

Sri Uttam Mandal,

Sri Subrata Saha

Publicity: Dr. S. Chowdhury,

Sri Binoy Goswami

Finance: Sri T.K. Basu, Dr. B.K. Sanyal,

Sri K.K. Pal

To whom it may concern

This is to certify that the paper entitled "Biodiversity in avian populations in the Raiganj Wildlife Sanctuary, West Bengal, India", read by Sri A.K. Das (A.K. Das & B.C. Pal) Department of Zoology, University of North Bengal, Darjeeling, 734013, India, on Nov 10-11, 2006 in the National seminar at Raiganj University college. That he was not given any T.A. or D.A. for the above purpose. This paper has been accepted for publication in the proceedings of the said national seminar.


DR. DALIP CH. SANAYAL
Convener
National Seminar on
Environment & Sustainable
Development, Nov 10-11,
2006

For Communication: 03523-242570 (Office), 242580 (Fax), 242573 (Res.)
President: Mobile: 9434386228, Convener: Mobile: 9434423903

VITA

1. Name : Ashis Kumar Das
2. Father's Name : Jadab Chandra Das
3. Sex : Male
4. Date of Birth : 7th May, 1967
5. Address : Vill. + P.O. - Kushmandi
Dist. - Dakshin Dinajpur,
West Bengal, Pin - 733 132.
6. Nationality : Indian
7. Academic Qualification :
 - a) M.P. at Kushmandi High School, Dakshin Dinajpur
 - b) H.S. at Sudarshanpur Dwarika Prasad Uchcha Vidyachakra, Raiganj, Uttar Dinajpur.
 - c) B. Sc.(Hons.) in Zoology at Raiganj University College, Uttar Dinajpur
 - d) M. Sc. (Special in Entomology) at University of North Bengal, Siliguri, Darjeeling.
 - e) B.Ed. at Raiganj B.Ed. College, Uttar Dinajpur.
8. Present Employment : Sudarshanpur Dwarika Prasad Uchcha Vidyachakra, Raiganj, Uttar Dinajpur.

9. Publications
- a) Clutch size, laying date and reproductive success of Little Cormorant. Proceedings of the Zoological Society, Calcutta 56 (2) : 97 - 102, 2003.
 - b) Parental Feeding Behaviour in Little Cormorant, *Phalacrocorax niger* (Vieillot) in Kulik Bird Sanctuary, Raiganj, Uttar Dinajpur, W.B. (Abstract), paper presented in National Symposium on “Assessment and Management of Bioresources” May 28-30, 2003.
 - c) Biodiversity in avian populations in the Raiganj Wildlife Sanctuary, West Bengal, India. (Accepted).
 - d) Nesting in Night Heron, *Nycticorax nycticorax* (Linnaeus) at Raiganj Wildlife Sanctuary, West Bengal India. Accepted in the Journal Environment and Ecology.

10. Author

