

Biology of Bubulcus Ibis and Alterations in Its Habits

Dr. Jasvir Singh Dalio ,Lec. In Biology

G.G.S.S.S. Budhlada(Punjab)-151502

Corresponding Author: Dr. Jasvir Singh Dalio

Abstract: *Bubulcus ibis* has worldwide distribution and in India it is common in variety of habitats. These birds selected such nesting sites which provided protection, stability, material to support and construct the nests as well as had feeding areas within foraging range. The nests were shallow platforms and 75 per cent of nests observed, were recorded in *Acacia nilotica*. Cattle egrets were opportunistic feeders and typically foraged in flocks often associated with grazing animals to pick off the disturbed insects and parasites of large herbivores. Due to anthropogenic activities and changing ecological conditions, these are being forced away from their natural habitats and habits. They were found fully adapted to noisy places for making nests and also for feeding. They have started following tractors and other agricultural machines, waiting for insects and other pray items, that are flushed out during agricultural operations. They have learned to fly towards smoke from long distances to catch insects trying to escape fire. Observations revealed that they worked as biological pest control agents as they eliminated maggots and other harmful insects from municipal and hospital wastes as well as they also removed agricultural pests. They were also observed to act as scavengers, eating flesh of dead mammals at sites of carcasses, along with dogs and crows. After the disappearing of vultures, they have become first line scavengers while earlier, these birds were last to come at such places. When vultures had not tolerated toxicity what will happen to these birds? is a serious matter. Excessive waste from these heronries damaged plants, and contaminated soil as well as water. Their colonies adversely effected the underlying colonies of *Apis mellifera*.

Keywords: *Bubulcus ibis* , biological pest control ,biology of cattle egret , scavengers

Date of Submission: 25-02-2018

Date of acceptance: 12-03-2018

I. Introduction

Bubulcus ibis (cattle egret) is a cosmopolitan species of heron (family, Ardeidae) found in tropics, subtropics and warm temperate zones. It has undergone the most rapid and wide reaching natural expansion. In India it is very common in variety of habitats like wetlands, fresh water sources, marshes, paddy fields, ponds, cattle pastures, roadsides, dumps, parks, sport lawns and agricultural farms etc. These birds are well adapted to many terrestrial and aquatic habitats [1]&[2], though it does not depend on aquatic habitats to survive [3] but make frequent use of them. It is also well adapted to urban, rural and agricultural ecosystems. Their ecological plasticity, especially for foraging is certainly one of the main causes of its expansion on planetary scale. They are gregarious and get group benefits like improved vigilance or reduced probability of attack by predators [4]-[11]. They are opportunistic feeders [12]-[15]. They are specialized in the direction of attendance on cattle and found in large or small parties around the grazing cattle, lunging out to seize insects disturbed by movement of these herbivores [16]. They perform a service by ridding cattle of leeches, ticks and other parasites. Egrets are generally seen in large flocks picking insects from freshly ploughed fields or fields being watered [17]. Being biological pest control agent it is considered important bird in agro-ecosystems [18]. They feed mostly on grasshoppers, crickets, flies, moths, spiders, frogs, crayfish, earthworms, snakes and rarely also eat fish. It also scavenges for edible refuse in garbage dumps.

Cattle egrets are colonial breeders and frequently found in mixed colonies with other species of herons and egrets. The breeding season is dependent on the monsoons, in Northern India from June to August and in South during November to December. Although different species of herons vary in their habitat preferences diet and behaviour, They have certain common fundamental requirements for nesting [19]&[20]. A good nesting site generally provides protection against predators, offers adequate stability and material to support and construct the nests, as well as there is access to adequate feeding areas within foraging range [21]-[29]. The bird appears most adaptive due to its versatile feeding habit and non specificity for nesting environment and are reported to nest in various types of ecosystems, in rural as well as urban setup.

A study was conducted on behaviour of *B ibis*, alteration in its habits and habitats according to changing ecological situations. Role of this species as biological control agent and as scavenger was also investigated .The expected outcome will also enhance the knowledge regarding ecology management techniques and environmental toxicity.

II. Study Area

The present study was conducted in Mansa district of Punjab (India), which is situated at latitude 29^o-59-00 N, longitude 75^o-24.00 E and elevation above the sea level is 210 meter. The climate in the area is typical semi-arid type with distinct wet and dry seasons. The normal annual rainfall of the district is 480mm. Agricultural forms the backbone of the district economy. There is excessive use of pesticides, weedicides and fungicides. River Ghagger, Bhakhra canal, Sarhind drain, other drains, canals and village ponds are main water-scapes or wet-lands. Biodiversity is in very critical condition. Strong ecological pressure has been observed. Vultures (*Gyps* sp.) have disappeared from the area due to excessive use of Diclofenac sodium and oxytocin in domesticated animals and destruction of habitat. Area under investigation has variety of ecosystems in rural and urban areas. Cattle egret is found abundantly in whole district.

III. Materials And Methods

The area under study was surveyed for two days per week from April to August during 2015 and 2016. Two visits of three hours each at selected hours of day (0800-1100 hours and 1600-1900 hours) were conducted for observations. Experiment related to insect picking were performed by using 11x50 optima Zenith binoculars and measurements of height of nests was done with calibrated measuring tape. To investigate food composition of these birds, observations of regurgitated food pellets from mouth of adults, gut content of chicks which died due to falling down from nests and crop content of adult birds, which were found dead near paddy fields due to pesticides poisoning, were taken and examined. Species of trees on which nests were present were enlisted. Damage to vegetation and *Apis mellifera* colonies due to droppings was also observed. Activity of these birds was recorded in different types of ecosystems, carcasses and areas with decaying municipal, hotel as well as hospital wastes. Behaviour of birds under investigation was also observed in various agro-ecosystems and waste lands. Observations of nest structure, eggs and persistent nature of birds were also taken.

IV. Result And Discussion

4.1 Selection of nesting site Most of nesting sites of cattle egrets were found near the human population or human interfered places in rural as well as in urban areas from where feeding places were in range. They used all the available tree species in locality like *Acacia* sp (*Acacia nilotica*) *Azadirachta indica* , *Cedrela toona*, *Zizyphus jujuba*, *Syzigium cumini*, *Eugenia jambilana*, *Morus alba*, *Moringa oleifera*, *Ficus bengalensis* *Ficus religiosa* and *Melia azedarach* etc. Seventy five per cent nests were recorded in trees of *Acacia* species. Selection of spiny or thorny trees, particularly *Acacia* sp. gave protection from predators, and also provide stability during wind and rain storms. Nests were found placed in fork shaped branches, which could hold them fast under adverse conditions. These results are in line with the observations of many workers [30]&[31]. *Eucalyptus* species was not used for nest building. This observation was similar to findings of other author [32] but egrets use these trees to sit and rest as well as for shelter around the year except during breeding season, when they shift to the trees of other species.

Cattle egrets were observed in every type of ecosystem with availability of, safe nesting place, nesting material and adequate feeding areas within foraging range. Similar type of conclusions were drawn by many workers [33]-[37]. All the nesting sites observed were safe for hatching and successful rearing of young ones. These observations were confirmed earlier also [38]-[41].

4.2 Nests The nests were rough, shallow, bowl shaped, not well lined and simple platforms. The material used for nest building was dry and rough twigs. Other materials like leaves or grasses were not found in nests. These observations were similar to that of some workers [42], while contrary to that of certain other authors [43] who reported that grasses were being used in nests by cattle egret. Nests were found in colonies. Some colonies were found near water bodies also. The average height of nests from ground was observed 5.75 ± 1.03 meter. They start making nests with the onset of monsoon. (late June to August). 3-5 eggs were laid. Colour of eggs was faint blue. Nests were also reused by these birds. They were highly persistent and showed greater fidelity to their nesting places as well as did not leave host tree easily even after regular disturbances.

4.3 Feeding habits Foraging of *B. ibis* was noted in all most all the types of ecosystems. Being opportunistic predator they fed on any abundant and accessible prey, as reported by many researchers [44]. Due to gregarious nature, these birds were found in parties along with grazing cattle and eat insects disturbed by animals. They were found in large number in the fields being watered, ploughed or disked [Fig.1], as reported earlier [45]-[48]. They were also observed foraging along with other type of herons. Examination of gut content of dead birds, regurgitated food stuffs of adults and their waste material as well as field observations showed that they fed on grasshoppers, crickets, flies, moths, blue bottle flies, *Calliphora* sp, cicadas, house flies, Dipteran maggots, spiders, crayfish, frogs, earthworms, fish, small reptiles etc. Their insectivorous nature had already been confirmed [49]-[55]. Presence of Amphibia in diet has also been reported [56]-[60]. Fish, reptiles, birds

(chicks) and mammals were found very less in diet. These results are also in line with that of other workers [61]-[63].

4.4 Basking behaviour During winter mornings, they were observed sitting silently on the top most branches of trees to enjoy sunlight [Fig.2].

4.5 Nuisance During observations, cattle egrets were noted as nuisance causing birds, when rookeries were adjacent to residential area or in apiaries. Noise from bird vocalization and flight activities in rookery, offensive odours emitted from accumulated droppings, decomposing birds and eggs at the site, caused nausea to some observers. Rookeries may cause potential disease threats. They damage plants, soil and water.

In apiaries, where boxes of *Apis mellifera* colonies were kept in shadow of trees and these trees became host of these birds later on, it became difficult to move them away from these trees and boxes of bee colonies got coated with droppings. It become very difficult to operate these hives due to foul smell of accumulated waste material, decomposing dead birds and eggs. Strength and activity of bee colonies decreased significantly under such condition

4.6 Damage to vegetation During observations it was recorded that cattle egrets showed great fidelity of nesting sites (Vegetation). They destructed vegetation as leaves got coated with droppings. The birds continued to utilize these trees even after death of vegetation. Small plants growing under the host trees were found dry No vegetation grew in soil with guano deposits (guanotrophy). Similar results were recorded by many scientists [64]-[67].

4.7 Pest control agent Gut content and foraging activity of these birds in various agro-ecosystems, areas having municipal waste, and observation on fauna present in such areas, revealed that These birds were very important biological pest control agents. Various crop pests were also consumed by them. Similar type of observation were confirmed by many researcher [68]&[69]. Investigation showed that areas with decaying hotel, residential, municipal and hospital solid wastes had house flies, *Musca domestica* (family, muscidae) and blue bottle flies, *calliphora* sp (family, calliphoridae) along with their maggots in abundance. These flies are well known vectors which carry pathogens on their hairy legs and mouth parts. Maggots would metamorphose and cause serious public health problem. It was observed that a single bird eliminated thousands of such maggots daily (3000 to 4000 picks/day which means 75 to 100 gm of maggots were consumed per day by this single bird)which indicated that *B.ibis* was an efficient predator of insect pests.Such type of information has also been reported earlier [70]&[71].

4.8 Alterations in behaviour and new adaptation Due to unsustainable development as well as agriculture and destruction of habitat *B. ibis* is being forced away from their preferred habitats and habits. During study following new adaptations and behavioural changes were recorded

4.9 Adaptation to Noise A large number of colonies were found in trees near bus stands, on sides of roads [Fig.3], railway tracks, industrial and man interfered areas. They did not bother noise caused by human voices, vehicles, horns and even pressure horns. They seemed to be fully adapted to noise pollution. Many workers [72]&[73] had confirmed that in present age of industrialization, urbanization, unsustainable agriculture and development, certain species of birds have started adapting to rapid changes brought by human beings. Cattle egret has ability to exploit human interfered habitats and breeding in industrial areas. They generally ignored noise caused by fireworks. It was observed that they have learned to follow farm tractors [Fig.4] and machines as they used to do along with cattle to capture the insects disturbed by them.

4.10 Conditioning to smoke , fire and watering Experimental birds were observed to have attraction towards smoke and fire generally caused by burning of paddy straw [Fig.5] or wheat straw and were seen flying towards those sites to capture insects trying to escape fire. These birds seemed had full adaptation for sensing smoke and fire, where they could feast on disturbed insects and other fauna. They were seen in large number in watered fields [Fig.6] Such type of results had been confirmed in many reports [74]&[75]. These birds gathered in fields being irrigated, to feed on insects escaping from water.

4.11 Major alteration, feeding on dead animals Cattle egrets were observed at the site of carcasses, eating flesh of dead mammals, along with crows and dogs Fig.7]. These birds were last to arrive at dead bodies in past, but are now becoming first line scavengers and their population at such sites has increased as vultures have totally disappeared from the area under investigation, more than two decades before. It is well known fact that vultures had disappeared due to excessive use of Diclofenac sodium, a cheap drug used in veterinary as an

analgesic, antipyretic and anti-inflammatory, as already been told by many workers[76]&[77] Oxytocin also had negative effect on reproduction of vultures. Cattle egret strategy of feeding on carcasses was not seen to be as efficient as found in case of vultures. Similar type of observations were recored by another author[78]also.



Fig.1-Cattle egrets picking insects from ploughed soil



Fig.2-Basking behavior of *B. ibis*.



Fig.3-Cattle egrets sitting road side



Fig.4-Birds under investigation following a tractor.



Fig.5-Burning of paddy straw



Fig.6-Cattle egrets in a field being watered.



Fig.7-Cattle egrets feeding on carcasses

V. Conclusion

Due to drastic environmental changes caused by increasing ecological pressure, unsustainable agriculture and development, *B. ibis* showed some new adaptations, behavioural changes and it is being forced away from their natural habitat and habits, however its population is increasing in every type of ecosystem. When vultures did not withstand the toxicity (Diclofenac and Oxitocin), can next line of scavengers be able to tolerate this toxicity, is a topic of further investigation. Excessive use of pesticides, weedicides, fungicides and bactericides in agro-ecosystems further intensify the toxicity. Scientists have to pay extra attention to next line of scavengers. If measures are not taken, in near future there will be introduction of next batch of scavengers and cattle egrets will disappear from ecosystems. Excessive use of above mentioned drugs and agrochemicals must be banned. The bird under investigation is an excellent biological pest controlling agent. People awareness programs should be conducted regarding beneficial status of cattle egret and its protection.

References

- [1]. A. J. Meyerricks, Diversity typifies heron feeding, *Nat. Hist.*, 71, 1962, 48-59.
- [2]. K. Seedikkoya, *Comparative ecology of certain paddy field birds with emphasis on the habitat quality*, Ph.D thesis, university of Calicut, Kerala, India, 2004
- [3]. M.D. Forgarty and W.M. Hetrick, Summer food of cattle Egret in North Central Florida, *AUK* 90, 1973, 268-280
- [4]. H.L. Brown, The evolution in diversity in avian social system, *Wilson Bull*, 76, 1964, 160-169
- [5]. W.D. Hamilton, Geometry for the selfish herd, *J. Theor. Biol.*, 31, 1971, 295-311
- [6]. I. Vine, Detection of prey flocks by predators, *J. Theor. Biol.*, 40, 1973, 207-210
- [7]. G.V.N. Powell, experimental analysis of the social value of flocking by starlings (*Sturnus vulgaris*) in relation to predation and foraging, *Anim. Behav.*, 22, 1974, 505.
- [8]. C.J. Barnard, Flock feeding and time budgets in the house sparrow (*Passer domesticus*) *Anim. Behav.* 28, 1980, 295-309
- [9]. B.C.R. Bertram, Vigilance and group size in ostriches, *Anim. Behav.*, 28, 1980, 27-33
- [10]. T. Caraco, S. Martindale and R.H. Pulliam, Avian flocking in the presence of a predator, *Nature*, 285, 1980, 400-401
- [11]. M.A. Elgar and C.P. Catterall, Flocking and predation surveillance in house sparrows test of an hypothesis, *Anim. Behav.*, 29, 1981, 868-872
- [12]. H. Heatwole, Some aspects of association of cattle Egrets with cattle, *Anim. Behav.*, 13, 1965, 79-83.
- [13]. Grubb, T.C., Adaptiveness of foraging in the cattle egret, *Wilson Bull.*, 88, 1976, 145-148.
- [14]. A.L. Rand, Social feeding behaviour of bird, *Fieldiana Zool.*, 36, 1954, 1-71.
- [15]. K. Seedikkoya, *Comparative ecology of certain Paddy field birds with emphasis on habitat quality*. Ph.D Thesis, University of Calicut, 2004.
- [16]. S. Ali, *The Book of Indian birds*, Bombay Natural History Society, Oxford university Press Mumbai 12th revised edition, 1941.
- [17]. J. Thomas, M. Chellappan and Bhaskar, Role of insectivorous birds in rice pest management, *International conference on Birds and environment*, Haridwar, India, 2004.
- [18]. V.V. Rao, Egrets and their role in environment, *International conference on Birds and environment*, Haridwar, India, 2004.
- [19]. H. Hafner, Heron nest site conservation in A.J. Kushlan and H. Hafner (Ed) *Heron Conservation*, Academic Press U.S.A, 2000, 201-215.
- [20]. T.K. Kler, M. Kumar and P. Mehta, Breeding Biology of cattle Egret *Bubulcus ibis* in villages of Ludhiana, Punjab, *Indian J. of Appl. Res.*, 4, 2014, 683-684.
- [21]. D.H. Thompson, Feeding areas of Great Blue Herons and Great Egrets within the flood plains of upper Mississippi river, *Colonial water birds*, 2, 1977, 203-213.
- [22]. D.L. Beaver, R.C. Osborn and T.W. Custer, Nest site and colony characteristics of wading birds in selected Atlantic coast colonies, *wilson Bull.*, 92, 1980, 200-220.
- [23]. H. Hafner and R. Brittin, Changes of foraging sites by nesting little Egrets *Egretta gazell* L. in relation to food supply, *Colonial water birds*, 6, 1983, 24-30.
- [24]. H. Hafner and M. Fasola, The relationship between feeding habitat and colonial nesting Ardeidae in Managing Mediterranean wetlands and their birds. IWRB, U.K. 1992, 194-201.
- [25]. H. Hafner, Heron nest site selection in *Heron conservation*, Academic Press USA, 2000, 201-215.
- [26]. E. Ludwig, L. Vancisek, J. Torok and T. Csorgo, The effect of nest height on the seasonal pattern of breeding success in Blackbirds, *Turdus merula, Ardea*, 83, 1994, 411-418.

- [27]. F. G. Buckley and P.A. Buckley, Habitat selection and marine birds in J.Burger, B.L. Olla and H.E. Winn (Ed), *Behaviour of marine animals*, Plenum Press, New York, 4, 1980, 69-112.
- [28]. K. L. Mathew and I.R. Gadvi, Distribution pattern and the size of cattle Egret, *Bubulcus ibis* heronries in Saurashtra region of Gujrat, India. *International conference on Bird and Environment*, Haridwar, India, 2004.
- [29]. M. Sbiki, H. Chenchouni and A.S. Bachir, Population increase and nest-site selection of cattle egret *Bubulcus ibis* at a new colony in drylands of north-east Algeria, 86, 2015, 231-237.
- [30]. S. Ali and S.D. Ripley, *Handbook of the birds of India and Pakistan*, Oxford university Press, 1, 1968, 66-68.
- [31]. H. A. Sharah, E.A. Ali and I.D. Mohammed. The feeding behavior of cattle egrets (*Bubulcus ibis* L) in northeastern arid zone of Nigeria, *J. Agri. Soc. Sci*, 4, 2008, 612.
- [32]. J. Hilaluddin, N. Shah and T.A. Shawl, Nest site selection and breeding success by Cattle Egrets and Little Egrets in Amroha, Uttar Pradesh, India, *Waterbirds*, 26, 2003, 444-448.
- [33]. S. Datta, Bird watching at Dibru-Saikhowa wildlife sanctuary, *Newsletter Bulletin No. 203, Biological series, Ottawa*, 73, 1966, 38-39.
- [34]. J.Snoddy, Feeding behaviour of cattle egret, *Bubulcus ibis*, *Condor*, 70, 1969, 137-143.
- [35]. R. Vyas, Spatial and temporal distribution of nests in a heronry, *Zoos' Print. J*, 21(8), 2006, 2339-2342.
- [36]. S. P. Bhatnagar, S.K. Shukla and M.S. Bhaum, studies on the distribution of the heronries in and around Ajmer city ecosystem, *News letter for Birdwatchers* 44(3), 2004, 46-47.
- [37]. W. R. Siegfried, The nest of cattle Egret, *Ostrich* 42, 1971, 193-197.
- [38]. C. J. Skead, The cattle Egret in South Africa, *Audubon Magazine*, 58, 1956, 206-209.
- [39]. H. Hafner, *Contribution 'a l' etude ecologique de quatre especes de herons (Egretta g. garzetta L., Ardeola r. ralloides scop., Ardeola i. ibis L., Nycticorax n. nycticorax L.) Pendant leur nidification en Camargue*, Ph.D. universite de Toulouse, France, 1977.
- [40]. A. Mahabal, Heronries in Raigad district, Maharashtra-a preliminary survey, *J. of the Bombay Nat. Hist. Soc.*, 87, 1990, 138-138.
- [41]. O. Fredrick, Ecology and influence of age and habitats on the diurnal activity Patterns of cattle egret (*Bubulcus ibis*), *IJSTR*, 4, 2015, 1-3.
- [42]. M. K. Iyer, Nesting of *Phalacro coracidae*, *Threskionithidae* and *Ardeidae* at Ahmedabad Zoo, *Newsletter for Birdwatchers* 44(3), 2004, 43-44.
- [43]. G. Gopal, A.K. Mathur and H.R. Choudhary, Study on breeding performance of cattle Egret, *Bubulcus ibis* in Kota division of Rajasthan, *International conference on Birds and Environment*, Haridwar, India, 2004.
- [44]. J. A. Kushlan and H. Hafner, *Heron Conservation*, Academic Press, London, 2000.
- [45]. J. J. Dinsmore, Foraging success of cattle egrets, *Bubulcus ibis*, The university of Notre Dame. *Doi:10.2307/2424157*, 89(1), 1973, 242-246.
- [46]. D. Scott, The feeding success of cattle egrets in flocks, *Elevier Ltd. Doi 10.1016/S0003-3472(84)80225-0*, 32(4), 1984, 1089-1100
- [47]. H. A. Sharah, *Breeding biology and feeding ecology of cattle egrets (bubulcus ibis) in North eastern Nigeria*, PhD. Thesis university of Maiduri, Nigeria, 1998
- [48]. M. E. Moser, Prey Profitability for adult grey herons, *Ardea cinerea* and the constraints on prey size when feeding young nestlings, *Ibis*, 128, 1986, 392-405
- [49]. [49] I. Kadry-Bey. The economic importance of the Buff-backed egret (*Ardeola ibis* L.) to Egyptian agriculture, *Bulletin of the Zoological Society, Egypt*, 4, 1942, 20-26
- [50]. S. Ikeda, On the food habits of the Indian cattle egret (*bubulcus ibis*, Coromandus) *Japanese J. of Applied Entomology and Zoology*, 21, 1956, 83-86
- [51]. E. C. Burns and J.B Chapin, Arthropods in the diet of the cattle egret (*bubulcus ibis*) in Southern Louisiana, *J. of Econo. Ento.* 62, 1969, 736-738
- [52]. S. E. Doumandji, B Doumandji- Mitiche and Hamadache, Place des orthopteres en milieu agricole dans le regime alimentaire du heron garde-boeuf, *Bubulcus ibis* Linne, a area El Mizan en Grande Kabylie (Algerie) *Mediterranean Faculty of land bouwiw, Gent university (Belgium)* 57/3a, 1992, 675-678
- [53]. M. Fallag, Analyse comparative de la composition des regimes alimentaires de la *Cigogne blanche (Ciconia ciconia* L, 1775) at du Heron grade boeufs (*bubulcus ibis* L, 1758) dans la vallee du sebaou (kabylie, Algerie) Report universite de blida, Algerie, 1995
- [54]. N. Bentamer, Las disponibilites en ressources entomologicas y modalidades de leur utilisation par deux echassiers, la *Cigogne blanche, Ciconia ciconia* (linne, 1775) Aves, Ciconiidae) at le heron garde-boeufs, *Bubulcus ibis* (Linne, 1758 Aves, Ardeidae) dans la vallee du Sebaou (kaby-lie, Algerie). These de magister, *Ecole Nationale d' Agronomie, Algerie* 1998
- [55]. P. C. Frederick and S.M McGehee, Wading bird use of waste water treatment wetland, in central Florida, U.S.A *Colonial waterbird*, 17, 1994, 150-59
- [56]. L. Gil, Bases para un estudio cientifico de alimentacion en las aves y resultado del analisis de 400 estomagos. Boletin de la Real sociedad Espanola de *Historia Natural*, 43, 1945, 9-23.
- [57]. X. Ruiz and L. Jover, Sobre la alimentacion otional de la garcilla bueyera *Bubulcus ibis* L. en el delta del Ebro, Tarragona (España). *Publicaciones del Departamento de Zoologia de la Universidad de Barcelona*. 6, 1981, 65-72.
- [58]. X. Ruiz, An analysis of the diet of cattle Egret in the Ebrodelta, Spain, *Ardea*, 73, 1985, 49-60.
- [59]. A. D. Jenni, Regional variation in the food of nestling cattle Egrets, *AUK*, 90, 1973, 821-826.
- [60]. A. D. Jenni, A study of the ecology of four species of herons during the breeding season at lake Alice, Alachoa county, Florida, *Ecol. Monographs*, 39, 1969, 245-270.
- [61]. R. L. Cunningham, Predation of birds by cattle Egret. *AUK*, 82, 1965, 502-503.
- [62]. M. C. Herrera, observaciones sobre una colonia de Garcillas Bueyeras en Andalucia, *Ardeola*, 20, 1974, 287-306.
- [63]. W. R. Duxbury, Food of nesting Cattle Egret and read cormorant, *Ostrich*, 34, 1963, 110.
- [64]. J. W. Arendt and I.A. Arendt, Aspects of the breeding biology of cattle Egret *Bubulcus ibis* in Montserrat, West Indies and its impact on the nest vegetation, *colonial waterbirds*, 11, 1988, 72-84.
- [65]. M. P. Harris, S. Wanless, T.R. Barton and D.A. Elston, Nest site characteristics, duration of use and breeding success in the Guillemot, urea *Aalge ibis* 139, 1997, 468-476.
- [66]. Anon, *Cattle Egret, all about birds*, Cornell Laboratory of ornithology, 2008.
- [67]. D. Muller-Dombois and H. Ellenbery, *Aims and methods of vegetation Ecology*, John wiley and Sons, New York, 1974.
- [68]. E.H.J. Middlemiss, Food of egrets, *Ostrich* 26, 1955, 159.
- [69]. D. N. Yadav. All India Network Project on Agricultural ornithology, *Annual Report, Gujarat Agricultural university, Anand*, 2000, 1-14.
- [70]. B. R. Blaker, Behaviour of cattle Egret *Ardeola ibis*, 40(3), 1969, 75-129.
- [71]. W. R. Siegfried, Aspects of feeding ecology of cattle egret (*A. ibis*) in South Africa. *Journal of Animal Ecology*, 41, 1972, 71-78.

- [72]. S. Subramanya, Distribution, status and conservation of Indian heronries, *Journal of the Bombay Natural History Society*, 93, 1996, 459-486.
- [73]. P. Patankar, I.Desai, K. Shinde and B Suresh, Ecology and breeding Biology of the cattle Egret *Bubulcus ibis* in an industrial area at Vadodara, Gujarat, *Zoos' Print Journal*, 22(11),2007, 2885-2888.
- [74]. Anon, *Reports by Cornell Lab of Ornithology cattle Egret*, 2003.
- [75]. Anon, Reports by Gulf States Marine Fisheries Commission (GSFMC), *Bubulcus ibis*, 2005.
- [76]. J. L. Oaks, M. Gilbert, M.Z. virani, R.T. Watson, C.U. Meteyer, B.A. Rideout, H.L. Shim and Iqbal choudhary, Diclofenac residues as the cause of decrease in vulture population, *Nature*, 2317, 2004,1-4.
- [77]. M. A. Taggart, K.R. Senacha, R.E. Green, Y.V. Jhala, B Raghavan, A.R.Rahmani and A. A. Meharg, Diclofenac residues in Carcasses of domestic ungulates available to environment *Internat*, 33, 2007,759-765.
- [78]. C. J. Feare, Scavenging and Kleptoparasitism as feeding methods on Segchelles cattle Egrets, *Bubulcus ibis,Ibis* 117(3),1965,388.

IOSR Journal of Pharmacy and Biological Sciences (IOSR-JPBS) is UGC approved Journal with Sl. No. 5012, Journal no. 49063.

Dr. Jasvir Singh Dalio. " Biology of Bubulcus Ibis And Alterations In Its Habits ." IOSR Journal of Pharmacy and Biological Sciences (IOSR-JPBS) 13.2 (2018): 09-15.