RESEARCH ARTICLE

Group Size and Age-sex Composition of Gaur (*Bos gaurus*) in Kuldhia Wildlife Sanctuary, Eastern Ghats, India

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Study Area: Kuldhia Wildlife Sanctuary, Eastern Ghats, India.

Coordinates: 21°20' N to 21°30' N (Lat.); 86°30' E to 86°45' E (Long.)

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Abstract

The Gaur is under the vulnerable category on Red list and Schedule-I species as per Wildlife Protection Act (1972) in India. Till date, little information is available on group size and age-sex composition of Gaur from Kuldhia Wildlife Sanctuary. Thus, by keeping the same in mind an investigation of group size and age-sex composition of Gaur was carried out during January to June 2013 in Kuldhia Wildlife Sanctuary. In addition, the secondary sources of data from 2007-2013 were also collected from forest department. During investigation 26 direct sightings and 72 saltlick record from different part of the sanctuary was considered. A total of 14 group-sizes were recorded and the group size varied from one to eighteen individuals. Solitary male group constitute 27.55% (n=27), which is the dominant group size from other three group (Mixed, all male and all female). For age and sex composition, gaur mainly classified into four type's i.e. adult male, adult female, juvenile (sub adult male and female) and calf. Total 98 (saltlick and direct sighting data) sightings consisted 453 individuals of gaur in KWLS, out of which 27 sightings were of loners. All the loners were adult male and they were found apart from the groups. Adult male constitute 22.51% (n=102) from the total number of gaur sighted.

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Introduction:

Gaur (*Bos gaurus*) is commonly referred as the Indian bison and is the largest living bovine belongs to the order Artiodactyla. Due to habitat fragmentation and rapid declining of population it is place under vulnerable category on Red list (www.iucnredlist.org), listed in Appendix I of the Convention on International trade in Endangered Species of Wild Fauna and Flora (CITES) and including in Schedule-I species of Wildlife Protection Act (1972).

Gaur is distributed in Bangladesh, Bhutan, Cambodia, China, India, peninsular Malaysia, Burma, Nepal, Thailand and Vietnam (Datta *et al.*, 1982; Grubb 2005). In India Gaur is distributed in more or less isolated patches, largely corresponding to the major mountain systems of the Western Ghats ranges, Central Indian highlands, South-western and North-Eastern Himalayas (Choudhury, 2002).

Group formation and age structure of a population is useful key for understanding dynamics of population growth of Gaur and estimating their life history parameters (Spillet, 1966; Stearns, 1992; Krause & Ruxton 2002). Age structure of a population expressed as inter-related aspect of the distribution of the number of individuals in each age group reflects fecundity, mortality, reproductive status and population increase. Sex ratio is an indicator of the reproductive potentiality of a species. A high percentage of young as compared to adults generally indicates a fast growing or thriving population in contrast to a relatively smaller percentage of young that usually indicates a sluggish rate of population increase.

Materials and methods:

Study Area: Kuldhia Wildlife Sanctuary (KWLS) is situated in the district of Balasore. It is a part of the mega habitat comprising Similipal-Kuldhia-Hadgarh located on northern tip of the Eastern Ghats and linked with Similipal through Sukhupada hills and Nato hill ranges. A total of 3.9 percent area was found to possess very high plant richness followed by high (21.2%), medium (42.1%) and low (32.8%) in the sanctuary were considering the rich on biological diversity. The sanctuary harbour mainly three types of forests, viz., Northern Tropical Semi Evergreen Forest, Peninsular (coastal) Sal Forest and Moist mixed Deciduous Forest (Champion & Seth, 1968). The area of sanctuary is 272.75 sq km being covers with three major reserved forests namely Kuldhia, Tenda and Devgiri R.F. besides some revenue forest along the fringe. In addition, some Cycus plants and few mangrove trees are also found at Gudikhola area. The Sanctuary is rich in complete biodiversity. Some of the noteworthy flora species are: *Shorea robusta* (Sal), *Terminalia tomentosa* (Asan), *Pterocarpus marsupium* (Bija), *Annogeissus latifolia* (Dhaura), *Dalbergia latifolia* (Pahadi sisoo), *Diospyros embryopteris* (Mankada kendu), *Embllica officinalis* (Amla) etc. with some bamboo

patches. The Sanctuary also harbours good numbers of Orchids, Cycas and varieties of medicinal herb. Being a part of mega-habitat, the sanctuary boost of harboring the largest land animal like Elephant. The main faunal group in reptiles *Ophiophagus hannah*, *Pytho molurus*, in aves *Anthracoseros coronatus*, *Bubulcus ibis*, *Halcyon smyrnensis*, *Perdix perdix*, *Passer domesticus*, *Oriolus oriolus* and *Cyanocitta cristata*, among mammals *Panthera pardus*, *Bos gaurus*, *Melursus ursinus*, *Axis axis*, *Muntiacus muntjak*, *Tragulus kanchil*, *Sus scrofa*, *Paradoxurus hermaphroditus*, *Manis crassicaudata*, *Ratufa indica* etc.

Data Collection: The survey was carried out during January 2013 to June 2013. Each wildlife beats coming under the sanctuary was treated as one survey unit for collecting data regarding group size and age-sex composition of gaur. All the trails and roads present in the beat was covered by foot walk sampling in early morning and evening hours for direct sighting or evidences left by gaur. As gaur is known to be very shy towards human, so trekking was done with minimum noise inside the forest and whenever a group of gaur was sighted, observation have been done carefully with the help of binocular and each individual was tabulated carefully as per age and sex classes based on the criteria mentioned by Schaller (1967) and Krishnan (1972).

Adult Male: Sooty black in colour, enlarged dewlap, well diverged and fully converged tip of horn, prominent dorsal ridge and rotary movement of hump while walking.

Adult Female: Dark brown and closer to black in colour, non-prominent dewlap, less diverged but fully converged tip of horn, less prominent dorsal ridge.

Sub-adult Male: Black or brownish black in colour, prominent dewlap, the diverged horn about to converge.

Sub-adult Female: Brownish black in colour (blackier in thoracic portion and more brownish colour in the rump portion), dewlap absent and less diverged but not converged horn.

Calf: Golden brownish in colour and can pass through between the legs of its mother (less than three months old and approximately 1m in height) in both sexes. No conspicuous white stockings.

However, the presence of the scrotum is the only morphological difference between the sexes, but is difficult to detect in free-ranging gaur of this age with appropriate modifications. While, age can be differentiate from their horn colour. As the age become older the white stockings in the horn is more and it was seen in a mature age of gaur that the horn is covered with fully white stockings. Proportion of different age and sex classes in the population was derived on the basis of all sightings during the study period. Apart from all the direct observations, 3-4 years before saltlick data were also collected as secondary data from forest department.

Results and Discussion:

Group Size: Total 26 direct sighting of present study and 72 saltlick record from different

part of the sanctuary by forest department from 2007 to 2013 was considered for better understanding. Total 14 group sizes were recorded and the group sizes were seen to be varied between one individual to 18 individuals (Fig. 1). The mean group size of gaur in KWLS was 7.9 ± 4.9 . Solitary male group constitute 27.55% (n=27) which was maximum group size followed by seven number constituted 13.27% (n=13), four number 12.24% (n=12), both five and six number had constituted 9.18% (n=9) eight number was constituted 8.16% (n=8), two numbers of gaur in a group observed seven times i.e. 7.14% (n=7), three number of gaur was observed five times 5.10% (n=5), 9 and 11 number of gaur sighted only two times

Figure 2. The group size ranges of Gaur

2.04% (n=2), finally 10, 12, 15 and 18 number of group size constitute 1.02 (n=1) respectively.

Group size range: A group size ranged from 1-5 individuals encountered maximum times i.e. 61.22% (n=60) (Fig. 2), then the number contains 6-10 individuals in a group consists 33.67% (n=33), 11-15 numbers of individuals in a group encountered only 4.08% (n=4), and finally 16-20 numbers of gaur present in a group sighted only one times i.e. 1.02% (n=1) respectively. The study indicates that as the group sizes become smaller in number it increases the number of sighting possibilities and as the group size

Grouping characteristics of Gaur: After analysis all the saltlick and direct sighting data, group of gaur divided into four categories i.e. all male group, all female group, mixed group and solitary male group. All male groups constitute only male (more than one), all female group constitute only female (one or more than one), mixed group included male, female, juvenile and calf, and finally solitary male constitute only single male (apart from the group). The study revealed that sighting of mixed type group density was higher other than all types of groups. Mixed type of groups constituted 66.32% (n=65) followed by solitary male groups 27.55% (n=27), all male groups 3.06% (n=3) and all female groups 3.06% (n=3) respectively (Fig. 3). The study indicates that maximum time gaur prefers to remain in mixed group and maximum male gaur prefer to remain solitary but they came and join the group at the time of rut. After breeding season adult male leave the group and remain solitary till next breeding season. In mixed group, adult female gaur were more in

Figure 1: The graph showing group size, frequency and percentage of Gaur.

Figure 3. The pie-chat showing the percentage of group size of Gaur

number followed by adult male, calf and juvenile. It was also observed that in all mixed types of group, there were presence of adult female gaur. In mixed group, number of female gaur vary from minimum one individuals to maximum 10 individuals, whereas male, calf and juveniles number vary from 1-3 individuals but it was seen that maximum times only one male was present in mixed groups.

Age sex composition: Total of 98 (saltlick and direct sighting data) sightings consists 453 individuals of gaur in KWLS, out of which 27 sightings were of loners. All the loners are adult male gaur and they remain apart from the groups. The gaur has been classified into four type's i.e. adult male, adult female, juvenile (Sub adult male and female) and calf. Adult females have the major proportion of the population i.e. 54.75% (n=248) followed by adult males 22.52% (n=102), calves 16.78% (n=76) and juveniles 5.96% (n=27) respectively (Fig. 4).

Figure 4. The proportion of Age-sex classes of Gaur (n=453).

Conclusion:

The present study indicates that adult female number were more in comparison to adult male, Calf and Juvenile respectively. Sightings of highest number of gaur in a group was 18 and it was recorded from Jodachua saltlick in the year 2010 but during the study a group consisting of 15 numbers of gaur also sighted from Jodachua saltlick. According to Sankar *et al.*, (2001) Gaur is a group living animal. Earlier it was established that the social organization of gaur herd consist of one or more related adult females and their offspring (Daniel *et al.*, 1987; Sukumar, 1989; Schaller, 1967), but, our study revealed that herd generally consists of adult males, adult females, juveniles and calves. Adult females had maximum influence on the group size. The adult male gaurs are found to influence the group only through adult females. This follows the same pattern as in the case of American bison (Meagher, 1973) and European bison (Krasinski, 1978), where the bulls neither dominate nor lead the group even during the rutting period. Larter & Gates (1994) observed similar pattern in the case of wood bison groups. This observation was supported by others (McHugh, 1958; Fuller, 1959). According to Spillett (1966) a population with more females than males generally has higher reproductive potential than the one that is predominantly composed of male. Our study also revealed same manners that population of female gaur is almost double of the male gaur, so it indicates that the populations of gaur at Kuldiha have a higher productive potential.

Over the year due to livelihood grazing, forest fire, scarcity of water, poacher and local tribal dependency on the forest for fire wood are the major conservational threats towards the gaur conservation. Awareness programme among local community, frontline forest staff and details study on gaur are inevitable for long term conservation and management of the species.

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