



Physical characteristics, management, and performance of newly recognized ‘Kathani cattle’ of Maharashtra state

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ABSTRACT

Kathani cattle is not a registered cattle breed, consequently, these animals are categorized as non-descript animals in the Livestock Census of the Government of India. The population is about 10.51 lakh. Data of 9474 animals spread over 118 villages distributed in 13 tehsils of 3 districts (Chandrapur, Gadchiroli, and Gondia) from the Vidarbha region of eastern Maharashtra was collected under the survey, evaluation, and characterization network project of NBAGR, Karnal, during November 2017 to March 2020 and analyzed to document the physical characteristics, management, and performance of a new cattle breed available/found in Maharashtra state. Qualitative body part characters indicated that almost all animals had black coloured muzzle, eyelid, eyeball, hooves, tail switch. Biometry recorded included eight different body measurements in different age and sex groups. When compared with Gaolao, Kosali, Motu, and Ongole breeds of cattle from adjoining breeding tracts, molecular as well as phenotypic differentiation indicated separate genetic identities of the Kathani cattle. Nearly 96% Kathani cattle owners were found to provide housing to their animals and about 87% of respondents provided shelter during the night only while 7.4% provided both during day and night. Respondents (74.70%) cultivated fodder for their animals and general fodder in the area was leftover (after crop harvest) of paddy locally called Tanis, and soybeans, mung, wheat, cowpea, chickpea, pigeon pea, black gram locally called Kutar. The feed and fodder laboratory analysis revealed that Kathani animals were reared on very low nutritive value content like Tanis and different types of Kutars. Natural service was the preferred breeding method adopted by 94.8% and 5.2% of owners bred their animals through artificial insemination with the semen of exotic breed bulls. Kathani cattle keepers (61.9%) in the survey area experienced incidence of some of the contagious diseases and 72.55% of cattle holders vaccinated their animals against these contagious diseases. The average age at first ejaculate for Kathani cattle males was 35.84 ± 0.31 months, age at first calving was 54.86 ± 0.05 months, calving interval was 486.85 ± 0.51 days, daily milk yield was 0.55 ± 0.01 litres, lactation length was 237.76 ± 1.82 days and dry period noticed was 245.75 ± 2.28 days. The study results will flag the way for the registration of the population as a new cattle breed and for the formulation of a breeding program for further improvement of this lesser-known cattle population.

Keywords: Biometry, Characterization, Kathani cattle, Performance, Population status, Vidarbha region

Understanding the diversity, distribution, basic characteristics, comparative performance and the current status of animal genetic resources is essential for their efficient and sustainable use and conservation. Complete national inventories, supported by periodic monitoring of trends and associated risks are basic requirements for effective management of animal genetic resources. Without such inventory information, some breeds/populations having unique characteristics may decline significantly, or be lost, before their value is recognized and measures are taken to conserve them (Singh *et al.* 2019). The Kathani cattle, which are distributed in Chandrapur, Gadchiroli, and Gondia districts of the Vidarbha region of eastern

Maharashtra state, is one such important indigenous draft-purpose cattle population and is being considered under the non-descript category. There are only scanty published reports, which ultimately do not throw much light on the status of the breed, general management practices being followed by the livestock owners, overall feed, fodder status for animals, and traditional practice of group animal grazing being followed in the breeding tract since ancient times. In view of this, the present study was undertaken to characterize the cattle population by making systematic surveys in the area.

MATERIALS AND METHODS

A study was conducted under the Network Project on Animal Genetic Resources coordinated by ICAR-NBAGR, Karnal for survey, evaluation, and characterization purpose of Kathani animals during November 2017 to March 2020 in 118 randomly selected villages distributed in 13 tehsils

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(five from Chandrapur and four each from Gadchiroli and Gondia districts) spread over 3 districts in Vidarbha region of Eastern Maharashtra. Total 9750 farmers were covered and individual farmer information on general management practices followed for these animals, feed and fodder resources available as well as ancient practices like group animal grazing was collected as per technical program described by Singh and Sharma (2016). The morphometric measures, viz. head (face) length, forehead width, ear length, horn length, chest girth, body length, height at withers, and tail length were recorded on 9474 animals belonging to different age groups and sexes. The reproduction (age at first calving, inter-calving period, and services per conception) and production traits (daily milk yield, lactation period, total milk yield) were recorded for 2182 and 845 cows respectively by interviewing animal owners. The collected information was analyzed by using standard statistical procedures.

RESULTS AND DISCUSSION

Origin, geographical distribution, and native environment of the breeding tract: The screening of old literature, Central Provinces District Gazetteers of Chanda district Volume A provide some details about this cattle population (Anonymous 1909). Kathani's name coined for the breed of cattle is not found very popular among the farmers and animals were either recognized as non-descript or were called 'Local' or 'Gavathi or Mulakhi'. On further searching literature, it was noticed that these animals are referred to as 'Telangpatti' in Chanda district Gazetteers. The climate of the breeding tract is hot and humid and witnesses monsoon, winter and summer seasons. The geographical data indicated the thriftiness of these animals in a varied range of temperature and rainfall ranging from 45°C and 1308 mm (Gondia district) to 5°C and 1428 mm (Gadchiroli district). Having deep and thick forests in these districts (locally known as Zadipatti districts, an area of forests and trees), 72% area is under Southern Tropical Dry Deciduous Forests. Major rivers are Wainganga, Wardha, Gadhvi, and Kathani flowing through these districts. The cereal crops like rice, sorghum, wheat, maize, and Kodo (millets) are cultivated and used as a staple food, cash crops like cotton and soybean are also found cultivated. This cattle population is named as Kathani due to its distribution in the Kathani river basin near Gadchiroli city. Due to heavy rainfall and marshy land for paddy cultivation, comparatively lightweight bullocks of Kathani cattle are well suited for all kinds of agricultural operations as mechanization of agriculture was less intense in the area.

Population status and average herd size: As per the 20th Livestock Census (2019), total cattle population in the breeding tract was 11,48,012. Since the breed-wise census is not available and Kathani cattle is not yet registered, the indigenous population in the district is considered from the census figures. In the survey area, 52,793 was the indigenous cattle population, out of which 97.97% (51,720) was Kathani cattle population, therefore, the

population of Kathani cattle is expected to be 10.51 lakh, which is much higher than Konkan Kapila cattle (Singh *et al.* 2019). Age group and sex-wise distribution of Kathani cattle in the survey area revealed that 62.53% of animals were breedable (3 years and above), 23.19% were young stock (1 - 3 years), while 14.27% were calves below 1 year. The results recorded in the present study collaborated with that of Khillar breed in Western Maharashtra, which specified 65.45% breed-able population, 20.75% young stock, and 13.81% calves below one year (Gokhale 2006). The average herd size per family was observed to be 5.30 ± 0.04 and ranged from 4.25 ± 0.04 in the Gondia district to 7.23 ± 0.12 in the Gadchiroli district. The observations of Mooventhan *et al.* (2016) and Prem Chand *et al.* (2018) for tribal cattle owners from Chhattisgarh state (adjoining to Kathani cattle breeding tract) herd size were found to be much less (2.88 and 2.59, respectively).

General management practices

Housing practices: The housing pattern for Kathani cattle in the survey area indicated that nearly 96% of owners provided housing to their animals while 4% of owners kept their animals without any housing facility. Moreover, 86.99% of respondents provided shelter during night-time and 7.41 % owners both day and night time. For Konkan Kapila cattle, housing was provided by 74.3% of owners (Singh *et al.* 2019). Amongst those who provided housing, 63.14% of respondents kept their animals in the open paddock and the remaining (36.86%) provided close-type housing. Being open paddock, urine drainage was a pukka type (81.85%) and having overall sanitary condition clean (75.73%). Nearly 34.14% of cattle owners had separate housing having kutcha type ceiling (65.59%), which was made from wood or dried cotton straws, and 34.41% respondents had pukka type housing facilities constructed from either brick, stones using clay as a cementing material as part of residence (64.86%). The flooring of the housing is mostly kutcha type (75.74%) and made up of mud and stones. Rathor *et al.* (2010) in the Churu district of Rajasthan reported all the cattle keepers had the kutcha floor in animal sheds. The majority of the respondents had their animals housed near their residence or as a part of their residence with half wall housing (82.74%) for the protection of animals from rains, wind, and wild animals. 58.50% of cattle owners kept their animals near dwelling houses.

Feeding practices

Use of fodders: Overall 74.70% of respondents cultivated fodder and general fodder in the area noticed to be leftover (crop harvest) of paddy locally called Tanis and soybeans, mung, wheat, cowpea, chickpea, pigeon pea, black gram locally called Kutar as well as local grasses. The majority of farmers were using un-chaffed fodder (86.25%), which might be because a major source of fodder was after harvest leftover which does not require chopping. The farmers, who had irrigation facilities were growing jowar, maize, berseem, etc. and they cut it into

pieces while offering to animals for which, they used pick-axe locally called 'Veelai' (66.63%) and axe (33.37%).

Use of feeds: The survey results indicated that 62.36% of farmers offered some or other kind of feed like crushed homemade (93.44%) rice bran locally called 'Kukus' and grains of wheat, oat, cotton seed cake, etc. Gadchiroli district owners (73.44%) were topper for offering feed and Chandrapur district owners were laggards (50.90%). This might be because Gadchiroli district is a major hub for paddy cultivation, which ultimately produces Kukus as a bye product while processing it for home consumption. Soaking of grains (98.50%) was preferred by the owners to cooking (1.50 %) before feeding the animals. The results of Rathore *et al.* (2010) in the Churu district of Rajasthan supported these findings. About 86.40% of respondents gave separate feed rather than mixed with fodder and at other than (77.76%) milking time.

The ancient practice of 'Dongi': The feed and fodder proximate analysis showed that Kathani animals were reared on very low nutritive value content fodder resources but not a single farmer provided any mineral supplement to their animals. However, a common practice of storing meal leftover like stale food, curry, hand wash water, etc. was common in the survey area. Such leftover was stored in a separate vessel made of either wood, stone or cement concrete having capacity of 8 to 10 litres and fixed structure locally called 'Dongi'. Whatever such leftovers gather in

the whole day mixed with some quantity of Kukus and fed to animals in next day morning, especially to working bullocks and milking cows.

Breeding practices: Natural service was the more common and preferred breeding method adopted by 94.83% of cattle owners. The result corresponds with the findings of Rathore *et al.* (2010) who reported that 86% adopted natural services. Those who had the nearby facility of Artificial Insemination (A.I.) also preferred to breed their animals through A.I. (5.17%) by using semen of exotic breed bulls as the semen of the Kathani cattle was not available at AI centers in the area.

Health management practices: Although indigenous animals are considered to be comparatively resistant to contagious diseases as compared to crossbred animals, 61.91% of Kathani cattle possessors experienced an incidence of contagious diseases and the incidence of FMD and HSBQ was found to be 26.48 and 4.81%, respectively. The prevalence of other health disorders like digestive complaints, general fever, lameness, poison, and respiratory disorder were also noticed and their percentage were 17.26, 4.96, 0.76, 0.43, and 6.21, respectively.

Majority (72.55%) of cattle owners vaccinated their animals against various contagious diseases and out of this, 30.42% of owners opted for vaccination against all three diseases, while 48.71% performed only FMD vaccination and 20.86% only HS & BQ vaccination. These

Table 1. Number and colour distribution (%) of different body parts experimental cattle

Body part	Sex / No.	Below 1Yr.		Young stock (1-3Yrs)		Heifers	Milking cows	Working & breeding bulls	Working bullock	Breeding bulls	Total
	Sex	M	F	M	F						
No. of animals		891	848	671	588	485	2535	284	2614	558	9474
<i>Body parts colour (%)</i>											
Coat	White	69.02	64.74	61.70	66.50	68.04	69.23	61.62	67.94	62.90	67.09
	Blackish	1.80	2.12	4.47	2.04	2.27	3.16	7.04	5.01	6.99	3.77
	Reddish	29.18	33.14	33.83	31.46	29.69	27.61	31.34	27.05	30.11	29.14
Skin	White	65.43	62.74	61.40	65.48	64.54	66.04	61.27	65.38	55.56	64.30
	Blackish	8.08	6.96	5.51	4.25	7.63	8.56	5.63	7.27	11.29	7.56
	Reddish	23.46	25.83	28.91	25.51	24.33	21.38	27.11	22.65	25.09	23.65
Muzzle	Kosa	3.03	4.48	4.17	4.76	3.51	4.02	5.99	4.71	8.06	4.49
	Black	95.17	94.10	96.57	95.41	97.11	96.69	97.89	97.21	96.06	96.39
	Carroty	3.82	4.60	1.79	2.38	1.03	1.85	0.70	1.38	2.15	2.12
Eyelid	Mottled	1.01	1.30	1.64	2.21	1.86	1.46	1.41	1.42	1.79	1.49
	Black	95.62	96.11	97.32	96.43	96.91	98.19	98.94	97.67	97.31	97.35
	Carroty	4.38	3.89	2.68	3.57	3.09	1.81	1.06	2.33	2.69	2.65
Eyeball	Black	98.77	98.82	99.11	98.64	98.97	99.13	100.00	99.12	98.75	99.03
	Carroty	1.23	1.18	0.89	1.36	1.03	0.87	--	0.88	1.25	0.97
Hoof	Black	96.41	95.05	96.27	94.56	95.26	96.21	97.18	96.79	94.62	96.07
	Carroty	3.59	4.95	3.73	5.44	4.74	3.79	2.82	3.21	5.38	3.93
Tail	Black	92.03	90.68	86.59	87.07	86.80	90.10	86.97	88.71	86.92	89.06
switch	Reddish	1.01	1.77	1.64	2.72	1.24	1.58	0.70	0.96	1.79	1.41
	Mixed	6.96	7.55	11.77	10.20	11.96	8.32	12.32	10.33	11.29	9.52
Vulva	Black	--	90.68	--	87.07	86.80	90.10	--	--	--	89.45
	Reddish	--	1.77	--	2.72	1.24	1.58	--	--	--	1.73
	Mixed	--	7.55	--	10.20	11.96	8.32	--	--	--	8.82

findings support the results of Sunil Kumar *et al.* (2017), who reported that 40% of respondents from the Thar Desert region of Rajasthan followed vaccination against contagious diseases, however, the findings of Eqbal (2011) and Pandey and Meena (2013) were in contradiction who reported that vaccination was not practiced by the majority of the respondents.

Animal group grazing: The traditional practice of group grazing of animals, was followed in the Kathani survey area. This might be because of the availability of open grazing land, especially in forest areas, and the manpower required for herding the animals. This promotes a zero-input system and whatever they earn from animals like a small quantity of milk, manure, and a bullock for agriculture are surplus to them. There are two major components of this group grazing; one is the availability of a common place to gather the animals before they actually go to grazing locally called 'Aakhar' in Gadchiroli district and 'Gohan' in Chandrapur and Gondia district and the other is a person who works as herder locally known as 'Gayaki'.

Qualitative body characteristics: Age group-wise colour characteristics of different body parts of experimental animals is given in Table 1. Three different coat colours viz., white, blackish, and reddish were found in the survey area (Fig. 1). The animals of white coat colour were highest (67.09%) followed by reddish (29.14%) and blackish (3.77%). Pawar (2002) in his study on Khillar animals from organized herd recorded white coat colour in 83.59% of animals. Overall 64.30% of animals were of white skin colour, 23.65% reddish, 7.56 % blackish and the remaining 4.49% animals were kosa coloured (combination of black and white). Jain *et al.* (2018) reported that 54% of Kosali cattle had a red coat colour followed by white (36%), black, and greyish white (5.5%), and mixtures of other colours (4.5%). Three types of muzzle colours noticed were black, mottled and carrot (colour of *Daucus carrota*). Almost all the Kathani animals were black muzzled (96.39%), 2.12 % carrot coloured and the remaining 1.49% mottled type muzzle. In Khillar animals, Pawar (2002) observed that black, mottled, and carrot muzzles were in 53.13, 38.28

and 8.59% of animals, respectively. The black eyelid and eye-ball colour was found in 97.35 and 99.03 % of animals, respectively while, carrot colour was noticed in 2.65 and 0.97% of animals, respectively. Animals having black coloured hooves were noticed to be 96.07 % and the remaining 3.93% of animals were carrot coloured hooves. In Khillar animals, black and carrot hooves were in 74.21 and 25.79%, respectively (Pawar 2002). The black colour tail switch was found in most of the animals (89.86%), followed by mixed (9.52%) and reddish (1.41%). It was noticed that 89.45% of females were of black-coloured vulva, 8.82% mixed colour and 1.73% reddish-coloured vulva. From a market point of view, qualitative characteristics have immense importance. In Kathani cattle, Kulkarni *et al.* (2013) recorded black muzzle in 99.32% of animals, eyelids, and eyeballs black in 99.05% of animals, and black hooves in 99.53% of animals.

Horn shape, colour and orientation: For horn character purposes, adult animals were considered as calves and young stock horns under the growing stage. More than half of the animals (52.87%) exhibited straight horns and the remaining 47.13 % of animals had curved horns. Overall 94.14% of animals had black-coloured horns and the percentage of white coloured horn animals was only 5.86. Horn curvature indicates the choice favoured by the farmer and his selective criteria for looking at the horns from the market point of view. The horn curvature having outward with pointing tips seems to be favoured by Kathani animal keepers as 64.58% of surveyed animals had such type of horns, followed by upward with pointing tips (16.87%) and inward with pointing tips (12.27%). The percentage of downward and front side horns tips was 2.88 and 3.39, respectively.

Morphometric measurements: Age group-wise biometric measurements of Kathani animals are given in Table 2. Males in the age group below 1 year and 1-3 years had average head lengths of 23.41±0.19 and 33.53±0.18 cm while head width of 10.56±0.07 and 13.72±0.07 cm, respectively. Corresponding measurements for females were 22.71±0.19 and 32.38±0.19 & 10.78±0.07 and



Fig. 1. Body colour variation in Kathani cattle

Table 2. Age group-wise bio-metric measurements (cm) of experimental cattle

Age group / parameters	Calves (<1 Yr)		Young stock (1-3 Yrs)		Heifers	Milking cows	Working & breeding bulls	Working bullock	Breeding bulls
	Male	Female	Male	Female					
No. of animals	891	848	671	588	485	2535	284	2614	558
Head length	23.41±0.19	22.71±0.19	33.53±0.18	32.38±0.19	36.91±0.19	37.97±0.09	40.54±0.26	42.92±0.10	39.26±0.19
Head width	10.56±0.07	10.78±0.07	13.72±0.07	13.30±0.07	14.27±0.07	15.01±0.05	16.13±0.11	16.93±0.06	16.08±0.10
Ear length	12.80±0.07	12.59±0.06	16.44±0.06	15.81±0.08	17.45±0.10	17.49±0.04	18.33±0.14	19.03±0.05	17.55±0.11
Horn length	--	--	--	--	--	12.56±0.11	11.74±0.28	17.57±0.12	10.42±0.26
Chest girth	80.08±0.49	78.72±0.45	113.30±0.52	111.56±0.54	127.03±0.48	131.06±0.24	139.56±0.88	150.61±0.29	137.53±0.57
Body length	66.56±0.38	65.87±0.37	92.78±0.43	91.39±0.55	103.28±0.51	107.26±0.21	114.60±0.77	122.90±0.23	110.27±0.53
Height at wither	71.53±0.39	70.59±0.36	94.28±1.01	91.90±0.51	101.57±0.43	105.10±0.58	112.28±0.63	119.32±0.48	109.62±0.52
Tail length	55.26±0.39	54.24±0.40	81.35±0.41	79.62±0.52	89.16±0.50	91.83±0.19	94.74±0.61	95.95±0.18	93.33±0.53

13.30±0.07 cm, respectively. Average head length and head width for heifers, milking cows, working and breeding bulls, working bullocks, and breeding bulls were 36.91±0.19 and 14.27±0.07, 37.97±0.09 and 15.01±0.05, 40.54±0.26 and 16.13±0.11, 42.92±0.10 and 16.93±0.06, 39.26±0.19 and 16.08±0.10, respectively. Average ear length was noticed as 12.80±0.07 cm in males below 1 year of age and 12.59±0.06 cm in females of the same age. Males of age group 1-3 years had ear length of 16.44±0.06 cm whereas, females of same age average ear length was 15.81±0.08 cm. The ear length averages for heifers, milking cows, working and breeding bulls, working bullocks, and breeding bulls were 17.45±0.10, 17.49±0.04, 18.33±0.14, 19.03±0.05, and 17.55±0.11 cm, respectively. Kulkarni *et al.* (2013) reported an average ear length of 17.04±0.18 cm in adult females and 18.64±0.13 cm in bullocks in Kathani cattle. In Gaolao animals, Anonymous (2008) reported an average ear length of 23.59 cm in males and 21.77 cm in females. Horn length was measured from its base to tip. Horn length of milking cows, working & breeding bulls, working bullocks, and breeding bulls recorded was 12.56±0.11, 11.74±0.28, 17.57±0.12, and 10.42±0.26 cm, respectively. In male calves below one year of age, mean chest girth, body length, and height at withers was 80.08±0.49, 66.56±0.38, and 71.54±0.39 cm, respectively. The corresponding figures for females were 78.72±0.45, 65.87±0.37, and 70.59±0.36 cm, respectively. The calves of both sexes were found comparatively bigger in size and tallest in Gondia district, followed by calves from Chandrapur district and lowest in Gadchiroli district. This might have a relation to environmental conditions, feed and fodder availability, and overall livelihood dependency on animals. In Kosali cattle 6 months old males, chest girth, body length, and height at withers was 55.18±2.19, 48.67±1.87, and 49.14±2.10 cm, respectively, while in females it was 54.22±2.43, 47.48±2.21 and 48.67±1.89

cm, respectively (Jain *et al.* 2018). The mean chest girth of young stock (1 to 3 years age) was noticed to be 113.30±0.52 cm in males and 111.56±0.54 cm in females. It was further observed that females were smaller than males. The average body length for males was obtained as 92.78±0.43 cm against 91.39±0.55 cm in females of the same age group. Height at withers averaged 94.28±1.01 cm in males and 91.90±0.51 cm in females. Kulkarni *et al.* (2013) observed 125.23±1.12 101.95±2.80 93.44±1.01 cm as chest girth, body length, and height at withers, respectively in Kathani cattle. The observations recorded in the present study were comparatively on the higher side than that of reports from Jain *et al.* (2018) for Kosali cattle of Chhattisgarh state for the age group of 12-24 months who reported chest girth, body length, and height at withers as 84.67±3.11, 72.56±1.59 and 72.11±1.69 cm, respectively in males and 81.12±2.39, 68.56±1.43 and 69.45±1.96 cm, respectively in females. In heifers mean chest girth, body length, and height at withers were recorded as 127.03±0.48, 103.28±0.51, and 101.57±0.43 cm, respectively. The corresponding measurements for milking cows were 131.06±0.24, 107.26±0.21, and 105.10±0.58 cm, respectively. In working and breeding bull's, chest girth was registered as 139.56±0.88 cm; it was noticed as 150.61±0.29 cm in working bullocks and 137.53±0.57 cm in breeding bulls. Overall body lengths in working & breeding bulls, working bullocks, and breeding bulls were observed to be 114.60±0.77, 122.90±0.23, and 110.27±0.53 cm, respectively. Overall height at withers in working & breeding bulls was 112.28±0.63 cm while it was 119.32±0.48 cm in working bullocks and 109.62±0.52 cm in breeding bulls. The animal group-wise comparison showed that farmers had more interest to maintain working bullocks in well body conditions as working bullocks were superior in all body measurements to that of working and breeding bulls as well as breeding bulls. The average length

of tail observed for male calves, female calves, young stock males, young stock females, heifers, milking cows, working and breeding bulls, working bullocks, and breeding bulls was 55.26 ± 0.39 , 54.24 ± 0.40 , 81.35 ± 0.41 , 79.62 ± 0.52 , 89.16 ± 0.50 , 91.83 ± 0.19 , 94.74 ± 0.61 , 95.95 ± 0.18 , and 93.33 ± 0.53 cm, respectively. Kulkarni *et al.* (2013) reported average tail lengths of 47.82 ± 0.78 , 59.08 ± 0.68 , 68.82 ± 0.66 , 71.26 ± 0.51 , 62.3 ± 20 cm in calves below one-year, young stock, adult female, working bullocks and breeding bulls of Kathani animals, respectively. The body measurements of Konkan Kapila calves, young stock, cows, and bullocks as reported by Singh *et al.* (2019) were observed to be conforming to Kathani animals' measurements with corresponding age groups.

Reproduction performance: The mean birth weight of males was 11.91 ± 0.18 kg, while that of females was 11.06 ± 0.19 kg (Table 3). The average age at first ejaculate and first service of Kathani breeding bull was noted as 35.84 ± 0.31 and 39.43 ± 0.24 months, respectively. These

Table 3. Reproduction performance of experimental cattle

Trait	Male	Female
Birth weight (kg.)	11.94 ± 0.18 (84)	11.06 ± 0.19 (62)
Age at first ejaculation (months)	35.84 ± 0.31 (280)	--
Age at first service (months)	39.43 ± 0.24 (280)	--
Age at first calving (months)	--	54.86 ± 0.05 (2182)
Average services per conception	--	1.48 ± 0.01 (2182)
Service period (days)	--	203.02 ± 1.08 (2182)
Calving interval (days)	--	486.85 ± 0.51 (2182)

Figures in parentheses indicate the number of observations.

breeding bulls are not maintained by professional breeders as that is routine practice in the Khillar breed, hence any bull in the grazing herd could be a breeding bull, which leads to indiscriminate breeding. Early first calvers can have a longer productive life and can produce more calves in their lifetime. In the present study, overall age at first calving was 54.86 ± 0.05 months. Prem Chand *et al.* (2018) and Singh *et al.* (2019) reported lower age at first calving as 43.65 and 49.27 months for indigenous cattle and Konkan Kapila animals, respectively. Services per conception is an indicator of the reproductive ability of cows. An increased number of services per conception leads to an increase in the service period, lactation length, and calving interval ultimately hampering the productive life of animals rendering it uneconomical for the farmers. On average 1.48 ± 0.01 services were required to settle the cows. The breeding efficiency of these cattle was better compared to Konkan Kapila cattle as they required 1.79 conceptions (Singh *et al.* 2019). The service period is one of the most important components of the inter-calving period for monitoring animals' calving frequency. Although very

short service periods do not allow proper involution of the uterus and complete the preparation of animals to carry the next foetus, long service periods are un-economical. The overall service period averaged 203.02 ± 1.08 days. A longer service period might have resulted due to longer suckling by the calves during free grazing. Mane *et al.* (1998) reported a lower average service period of 173.60 ± 13.01 days for Khillar animals maintained at Government Khillar breeding Farm, Junoni (Solapur district). The service period of Konkan Kapila cattle was comparable to this (Singh *et al.* 2019). Animals having timely calving, optimum calving interval, and a better reproductive life are useful from a farmer's point of view. An animal of a shorter calving interval is always welcome for better economic gain. In the present survey, the calving interval averaged 486.85 ± 0.51 days. Lower estimates of an inter-calving period of 15.05 months for indigenous cows have been reported by Prem Chand *et al.* (2018).

Production performance: Rearing of these animals for milking purposes is not a routine practice in breeding tract hence all farmers adopted the suckling method. The average suckling period was 7.94 ± 0.06 months (Table 4). The average milk production was 0.55 ± 0.01 liters per day. Prem Chand *et al.* (2018) for Kosali cattle, Mooventhan *et al.* (2016) for non-descript animals, and Singh *et al.* (2019)

Table 4. Production performance of experimental cattle

Traits	Females
Suckling period (months)	7.94 ± 0.06 (845)
Daily milk yield (litres)	0.55 ± 0.01 (845)
Lactation milk yield (litres)	193.07 ± 5.28 (845)
Lactation length (days)	237.76 ± 1.82 (845)
Dry period (days)	245.75 ± 2.28 (261)

Figures in parentheses indicate the number of observations.

for Konkan Kapila cattle indicated higher milk production potential of 1.86, 1.24, and 2.23 liters per day, respectively. The average lactation length was noted as 237.76 ± 1.82 days with lactation milk production of 193.07 ± 5.28 liters. The lactation of Konkan Kapila cattle was less (226.53 days) but total milk production was higher (555.66 kg) as compared to Kathani cattle (Singh *et al.* 2019). The lactation length for Motu cattle (adjoining area breed) was slightly shorter (5-6 months) as reported by Anonymous (2016). However, the findings of Prem Chand *et al.* (2018) from Chhattisgarh tribal indigenous cattle for lactation length were comparable (7.72 months) to the mean lactation length noted in the present investigation. The average dry period was noticed as 245.75 ± 2.28 days. The consumption of milk for a household purpose is not followed routinely in the breeding tract as 36% of respondents said that they don't have a habit of using milk even for their children for which they had given various reasons like cow did not allow to draw the milk (2.37%, respondents), since ancestors period no habit of drawing the milk of a cow (10.78%), the cow does not give sufficient milk to fulfill requirements of the calf (86.85%), etc.

Differentiation of Kathani cattle population on a molecular basis: The genetic diversity and relationship between an unexplored local cattle population (Kathani) and four established cattle breeds of adjoining area (Gaolao, Kosali, Ongole, and Motu) by using 20 FAO recommended microsatellite markers was assessed. High variability was recorded in the Kathani population with a total of 198 alleles that varied between 5 (ILSTS11, TGLA22, INRA05) and 17 (ILSTS34) with a mean of 9.9 ± 0.73 . The average observed heterozygosity (H_o) was 0.658 ± 0.054 . Heterozygote deficiency was not significant ($FIS = 0.029 \pm 0.063$) indicating random mating prevalent across this population. Mean estimates of the observed number of alleles and heterozygosity over all the loci and five populations were 9.73 ± 0.421 and 0.617 ± 0.022 , respectively. In the overall populations, the homozygote excess (FIT) of 0.293 ± 0.032 , was partly due to the homozygote excess within breeds ($FIS = 0.121 \pm 0.025$) and to a larger extent due to high ($0.05 < FST < 0.15$) genetic differentiation among them ($FST = 0.195 \pm 0.029$). Substantial pairwise Nei's genetic distance and high population differentiation indicated the separate genetic identity of Kathani cattle. The analysis of genetic structure based on the Bayesian approach indicated that the most probable number of clusters is five confirming definitive genetic differentiation among all the populations. The entire analysis showed that a significant amount of genetic variation is maintained in Kathani, a lesser-known cattle population that is distinct from the recognized breeds in the proximity (Sharma *et al.* 2020).

Based on this study, the Kathani cattle population has been recommended for registration as a 51st new breed of cattle and an application for the same has been filed by the authors with the recommendations of the Commissioner of Animal Husbandry in Maharashtra state. After registration of the population, an organized herd of Kathani cattle may be established in the native tract for further research and development of this breed and attempts may be made to establish the Breed Society of Livestock Keepers to rear this cattle population for overall development, marketing, and conservation. State Animal Husbandry Department also takes care of the census, genetic improvement, and further development of this cattle breed by making necessary arrangements in the state's livestock breeding policy. The male calves born to elite cows in terms of milk production may be reared and developed into breeding bulls to be used for natural mating or artificial inseminations of cows at the farmer's door.

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