Indian Journal of Animal Sciences **87** (5): 653–655, May 2017/Short communication

Practical methods of gender identification in Kashmir geese

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Received: 2 September 2016; Accepted: 28 October 2016

Key words: Acoustics, Gender identification, Kashmir-geese, Vocalization

Geese contribute a significant share to alternate poultry after ducks in places like Kashmir (Hamadani *et al.* 2013) where water bodies are abundant. Kashmir geese show fast juvenile growth, but low egg production (Hamadani *et al.* 2014a), hence females are usually retained for propagation while males are sold. Therefore, at marketable age, it becomes necessary to separate males and females in a flock. Gender identification in geese by visual examination at a distance is difficult, since morphologically there does not exist any strikingly differentiating feature between males and females (Hamadani and Khan 2016a). Hence, a study was planned to determine a practical method for gender identification in Kashmir geese in the field conditions.

Three approaches were employed to study the methods of gender identification in Kashmir geese, viz. field survey, examination of external genitalia and vocalizational study. The information regarding the methods of gender identification practiced by geese-rearers were documented by interviewing 112 geese rearers in a field survey using a pre-tested questionnaire. Geese (30) with 15 birds of each sex were obtained from the farmers and information regarding the sex of each bird was noted down. These birds were kept at the poultry farm of Division of Livestock Production and Management, and external-genitalia of each bird was examined carefully by standard technique in order to expose the genital organ. The same 30 geese, whose external genitalia were examined, were closely observed for their vocalizations (acoustic analysis). Different types of sounds produced by them were observed, recorded and analyzed using sound analyzing software program (Charif *et al.* 2006) and audiograms generated thereof were keenly studied. Field visits were also made to record the sound of 20 goslings to assist in differentiating the adult sounds with gosling sounds.

Field survey revealed that geese rearers used various criteria for gender identification of their geese, which included difference in the voice, knob-size, gait, neck-length, body-size, temperament and presence/absence of paunch (egg pouch). According to the surveyed farmers, ganders had larger knob, longer neck, bigger body, aggressive nature and no paunch. The peculiar voice and gait in males and females was also reported to be a differentiating feature. Majority of the farmers identified gender of their geese on the basis of vocalizations followed by knob size, neck length and body size, whereas only a small proportion farmers considered aggressiveness, gait and presence/absence of egg pouch also a criteria for gender identification. The adoption rate of these criteria is given in Table 1. Larger knob (diameter wise), longer neck and bigger body in males was confirmed in the morphometric study conducted earlier on Kashmir geese (Hamadani *et al.* 2014b). Wyeld *et al.* (1980) also reported that ganders are slightly larger in size with a longer and thicker neck, larger and more bull like head, and a higher pitched shrill voice. Morphological differences like knob size, neck length and body size appear to be less reliable and not easy to interpret, which could lead to confusion since weaker/younger male in a flock could have smaller dimensions than stronger/older female. Gender identification by behavior like aggressiveness and gait did not seem to be a popular method, which could be due to less aggressive nature of the species (Hamadani and Khan 2016b) and the tendency of stronger males to dominate weaker ones. However, sexing birds on the basis of vocalizations seemed to be the most popular method among farmers, hence a detailed study of vocalizations was also undertaken.

Table 1. Criteria for gender identification adopted by the farmers

Criteria for gender identification	Number of adopting farmers (N=112)	Adoption rate (%)
Vocalization	97	86.61
Knob size	74	66.07
Neck length	52	46.43
Body size	30	26.79
Aggressiveness	15	13.39
Gait	15	13.39
Paunch	8	7.14

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Fig. 1. Copulatory organ of a gander.

Examination of the external genitalia revealed that well developed, spiral-like and creamy white coloured copulatory organ (Fig. 1) was clearly visible in ganders while no such structure was present in female birds as has also been reported by Clauer and Skinner (2007). Waterfowls are reported to be among the few birds that have a copulatory organ (Briskie and Montgomerie 1997). The copulatory organ of ducks have also been reported to be spiral (Brennan *et al.* 2010) but in ostrich the same has been described as a thick grey-white ellipsoid structure (Zhang and Ren 2011). The method although showed 100% accuracy but had a disadvantage of being cumbersome consuming time and labour both, since birds need to be caught and handled one by one, which can turn out to be tough job in large flocks.

Vocalizational study (acoustic analysis) revealed that the sound produced by the ganders was of higher pitch than that of the females, as also reported by Johnsgard (1965) and Wurtz (1995). Different types of sounds, each of one syllable was recorded to be produced by different groups of geese in a flock. Both sexes in geese have been reported to utter pig-like grunts of one syllable Johnsgard (1965). The difference in the sound produced by goose, gander and gosling was quite easily audible when little attention was paid to their respective vocals, and the same was confirmed by their audiograms. Each syllable of the male cry was found to be of longer duration in comparison to gosling and female cry as depicted in Table 2.

Another sound which was observed to be produced mostly by the ganders was the hissing sound having the longest syllable duration amongst all the sounds recorded including the male cry (Table 2). Hissing sound has been reported to be produced by only ganders to display aggression (Anonymous 1999), but Wurtz (1995) reports that both sexes hiss. The wave forms of the recorded sounds are presented in Fig. 2. The accuracy of this method varies

Table 2. Syllable duration of different cries produced by geese

Type of sound	Syllable duration (sec)
Male cry	0.464 ± 0.008
Female cry	0.207 ± 0.003
Gosling cry	0.254 ± 0.002
Hissing sound	1.522 ± 0.026

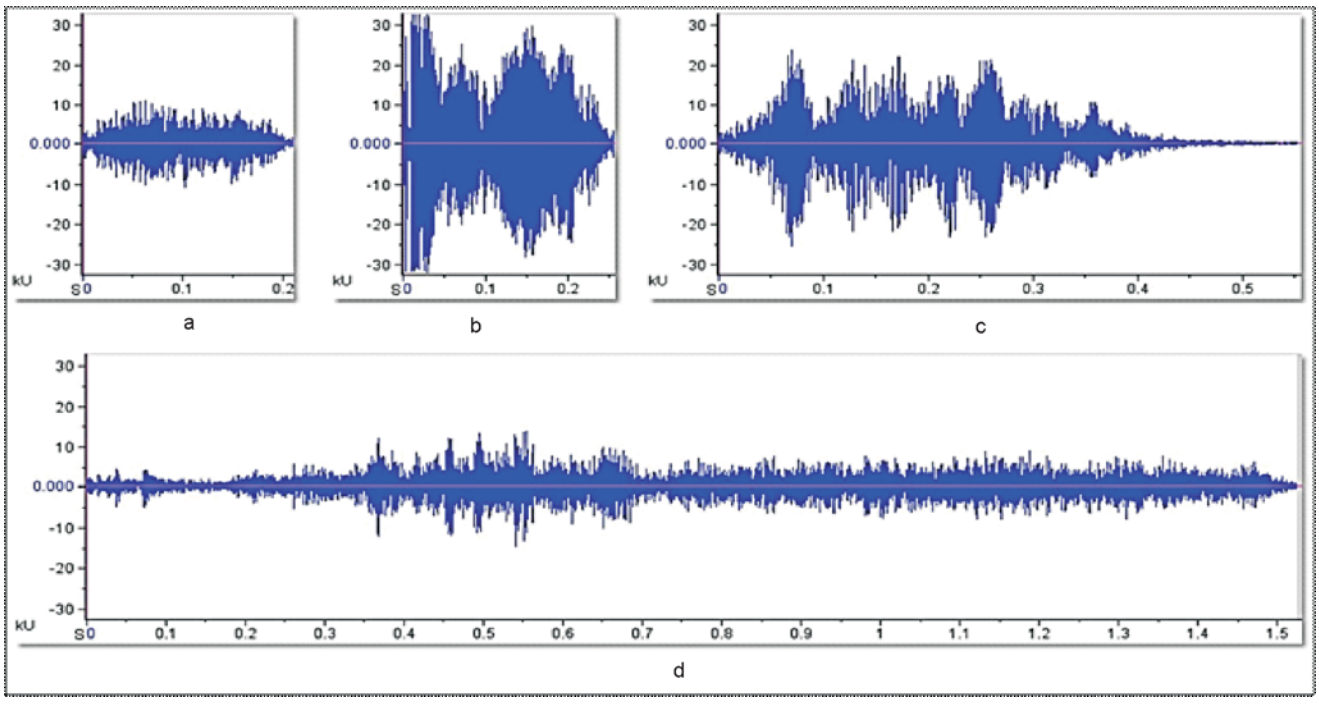

Fig. 2. (a): Wave form of a female sound; (b): wave form of gosling sound; (c): wave form of a male sound; (d): wave form of hiss.

depending upon the experience of the farmer, which increases with time as the farmer's ears get trained to differentiate between the different vocalizations. The advantage of this method over the other methods is that it is easy and quick as the birds can be sexed from a distance, hence avoiding the trouble of catching and handling them one by one. The adoption rate of this method was high with 86.61% of the farmers satisfied with it. Volodin *et al.* (2015) also studied the gender identification in birds using acoustic analysis and described that a single call per individual was sufficient for 100% reliable sexing for adult birds of 25 species by ear or using spectrographic analysis.

SUMMARY

A study was conducted to determine a practical method for gender identification in Kashmir geese and results revealed that it could be carried out by various methods like differentiating by vocalization, visualization of copulatory organ, and differentiating by morphology and behavior. It was established that examination of external genitalia was the most reliable method (100% accuracy), however in view of being cumbersome and requirement for handling of birds, vocalization method with high adoption rate (86.61%) could be the best practical method under field-conditions especially in large flocks.

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