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Non-invasive sexing of wild and companion birds

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Abstract

Based primarily on phenotypic traits, birds are classified as monomorphic or dimorphic. It has been estimated that approximately 60% of bird species are monomorphic, and it becomes difficult to identify the sex during early stages of life. Bird spectators, biologists, and conservationists particularly want to distinguish between the various sexes of birds when they are in their natural habitats or the wild. Still, distinguishing the sexes of monomorphic birds at a distance has proven to be challenging for even seasoned biologists and aviculturists. Exotic and domestic birds can be sexed using a variety of techniques, including non-invasive approaches like morphometric observations, voicing, and vent sexing, as well as invasive approaches like laparoscopy and moderately/minimally invasive approaches like karyotyping and DNA-based procedures. It becomes evident that non-invasive techniques for determining a bird's sex cause less stress for the birds.

A. Introduction

Birds are classified into two categories: dimorphic and monomorphic, depending on the general traits of male and female birds, however dimorphic birds can be clearly distinguished as male and female based on their appearance. In about 60% of bird species, there is no obvious sexual dimorphism, and gender might be difficult to determine based alone on phenotypic characteristics. It is difficult to distinguish monomorphic birds—which include many species of parrots, geese, and even cranes—based on body colour and size causes various problems in both captive birds and wild populations. Even for investigators, sexing monomorphic birds at a distance is extremely challenging.

B. Different sex identification techniques

1. Vent Sexing

Using this technique, one can feel the presence or absence of a female bird's clitoris or the male reproductive organ phallus by pushing the cloaca and gently moving it to the front with the thumb. This approach has been used in a variety of species, including penguins, ratites, greater Rhea chicks, and maleo birds. It also indicated that, in comparison to genetic approaches, this approach is a good alternative for sex identification in larger Rhea birds.

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Figure 1: The protrusion is visible in males(A) whereas it is absence in female (B)

2. Feather Sexing

Feather sexing is based on differences in feather features, which are determined by a precisely chosen genetic trait present in male and female day-old chick strains. The feathering pattern of females is faster than that of males. In J. quail, females are distinguished by their light tan feathers and black spots on their chest and throat, while males are distinguished by their rusty brown breast feathers and throat.

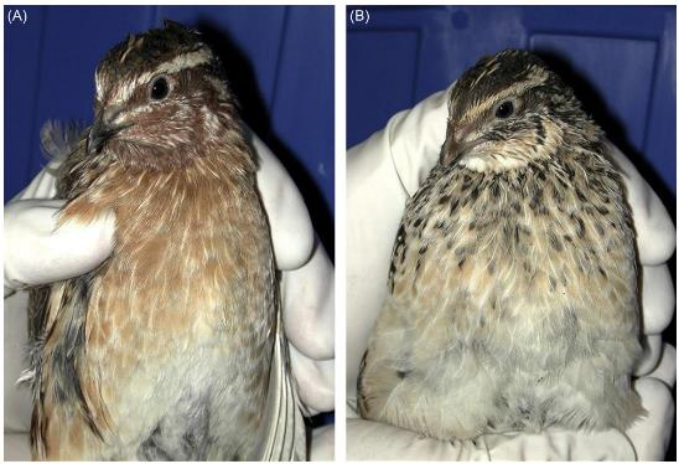

Figure 2: Wildtype plumage of a male (A) and female (B) adult Japanese quail (Coturnix japonica).

3. Morphometry

There are many physical distinctions between male and female birds that can be utilised to determine sex. When it comes to sex differentiation, lectus parrots are the easiest breeds to keep as pets (Figure 3).

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Figure 3: Eclectus parrot males are green in colour, while females are red.

One phenotypic trait that helps distinguish between the sexes in certain bird species, such as cockatoos, is eye colour. It has been shown that cockatoos with red iris are exclusively female, while those with brown iris could be either immature females or males. Male and female cape vultures can be distinguished from one another using head morphometry. Using head length, width, and bill depth as predictors, it was discovered that men had shorter, wider heads than females, and that their bill depth was also greater.

4. **Pelvic Sexing**

Pelvic sexing, however highly dubious in its accuracy, is also utilized in sex distinction, particularly for companion birds. The space between the two pelvic bones—which is less in males than in females—is felt when the bird is palpated from its ventral side. Additionally, it clarified that to aid the laying of eggs, females exhibit a notable separation between those two pelvic pumps.

5. **Steroid sexing**

The sex of birds has been identified by analyzing the estrogen to testosterone (E/T) ratio in their faecal sample. Although there is a seasonal variance in taking hormones into account during breeding seasons of some orders, this method is a good solution for invasive procedures with roughly 70 percent accuracy of sex determination.

One of the greatest non-invasive methods for determining a sex and assessing its gonadal and adrenal functioning is the fecalsteroid hormone treatment, which works very effectively for uncommon and endangered prey birds. In addition, male harpy eagles had greater mean faecal androgen levels during courtship than during copulation and incubation, while female harpy eagles were predicted to have higher mean faecal estrogen concentrations during same periods.

6. **Acoustic method**

This method primarily uses spectrogram analysis to examine computer images of vocalization. Although it is also possible to distinguish between the sexes of birds by using spectrograms or power spectra analysis of voicing, natural voicing is not as accurate or objective

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in this regard. Because of this, a wide variety of bird species can have their sex identified using this technique. For example, the male Little Spotted Kiwi (Apteryx owenii) has a loud whistle sound that is 1.5 times higher than the female's basal frequency (1800 Hz) at 2800 Hz. Even if certain dimorphic traits were present in those species, the method works better for recognizing those species at a distance, particularly in the wild. However, the situation is opposite for white-faced whistling ducks (Dendrocygnaviduata). Male and female calls were measured to have maximum fundamental frequencies of 4500 Hz and 5300 Hz, respectively. When sex distinction of day-old chicks in chicken farming is required, vocalization is an excellent substitute for labor-intensive manual sexing techniques. Three characteristics have already been used to construct an existing approach employing vocalization end points: duration, short-term energy, and short-term zero crossing rate. For each measure, the average accuracy of sex determination for day-old chicks was 91.25%, 87.08%, and 87.33%, respectively. The sounds of male domestic hen chicks were consistently shorter and had a greater basal frequency than those of female day-old chicks.

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