The long-term stability of pair-specific duet structures in the red-crowned crane *Grus japonensis* can be used for the vocal-based monitoring of territorial pairs through the years.

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**INTRODUCTION**

The vocal-based monitoring has proved its use in many bird species and is promising for the red-crowned crane (*Grus japonensis*). This species counts in the wild hardly over 2000 birds and is Endangered in the IUCN Red List status. Loud duets of nesting pairs can be recorded properly from a distance 800 m in nature and are potentially appropriate for the monitoring, however their use in conservation is prevented in the absence of knowledge if the duets are pair-specific and stable through the years.

**Figure 1.** Spectrogram of the red-crowned crane duet

**Duet structure**

All duets contained introduction and main part. The introduction is an unordered alternation of pair mate calls. The main part is a regular sequence of syllables. Each syllable contains 1-2 male and 1-4 female calls (Figure 1).

**Figure 2.** Measured syllable parameters within duet

**Interpair differences**

To test interpair differences in red-crowned crane duets we select 88 duets of good quality (5-10 duets per pair, overall 10 pairs). We measured 8 frequency and temporal parameters from duet syllables (Figure 2) with Avisoft-SASLab Pro. The discriminant analysis standard procedure showed 97.7% correct assignment to pair, significantly higher than the value expected by chance. The most important parameters to discrimination are the maximum fundamental frequency of first female call (Fmax_F1), the maximum fundamental frequency of male call (Fmax M) and the duration of male call (Dur M).

**Figure 3.** Percentages of five syllable types within duets.

**Stability of pair identity**

For five captive pairs, we examined stability of duet structures throughout four years, 2003-2006. We took 4-20 duets per pair per year, 272 duets in total. We measured the same 8 temporal-frequency parameters per duet syllable (Figure 2). MANOVA showed that the effect of pair identity on the syllable parameters was always stronger than the effect of the year of recording. Discriminant analysis standard procedure showed high percentages of correct classification to pair, varying from 98.2 to 100% between years. Cross-validation of duets from the test sets (representative by samples of 2004, 2005 and 2006) with discriminant functions derived from the training duet sets (represented respectively by pooled samples of 2003, 2003-2004, and 2003-2005) showed comparable high percentages of correct classification to pair, varying from 91.2 to 95.4% between analyses (Figure 4).

Reliability of identification for 5 examined pairs was very high both within- and between years. For pairs 1, 4 and 5, the correct assignment of duets to pair was always 100%, whereas mistaken assignment occurred between pairs 2 and 3 (from 1 to 5 of their duets were incorrectly classified in different years). However, these two pairs did differ strongly by percentages of syllables, containing one or two female calls per male call in their duets (Figure 3).

**Figure 4.** Similarity in duets of five pairs in four years

**Conclusion**

Red-crowned crane pairs could be reliably identified by 8 time-frequency parameters of their duets. Combining the quantitative and qualitative indicators has allowed to enhance the reliability of pair identification to 100% for all examined pairs.