A Preliminary Note on Plumage Colouration in the Japanese Marsh Warbler Locustella pryeri: A Comparison between Two Local Populations

Masao Takahashi¹, ³, *, Gen Morimoto¹, ², Jun-ichi Ebina³ and Akio Miya³

Abstract. The Japanese Marsh Warbler Locustella pryeri is an endangered species that has two large breeding populations (Hotoke-numa and Tone River) in Japan. These are thought to comprise the same subspecies, although the morphological and genetic data for the two populations have never been compared. Recent body measurements suggest that these two populations may differ in wing length. In this study, we compared the plumage colorations of these two populations using photospectrometric measurement, and found them to have similar reflectance patterns of plumage coloration. Although we found no difference in colours between the two populations, future work should concentrate on describing and comparing the two populations using additional colour data.

Key words: Hotoke-numa, Japanese Marsh Warbler Locustella pryeri, Plumage colours by photospectrometric measurement, Population, Tone River.

Introduction

Presently, many species are threatened with extinction and conservation of wildlife is an important global issue. In many cases, species or subspecies classes, which are identified by morphological or genetic information, are believed to be valid units of conservation. However, phenotypic or genetic differences sometimes exist among local populations of the same species, or even subspecies, and such differences may be important for genetic diversity. To conserve wildlife effectively, we must first consider taxonomic positions at the local population level. If we make mistakes in recognition and undervalue the differences among local populations, genetic diversity within species may be lost. For this reason, basic information on morphology or taxonomy at the local population level, as well as breeding biology, is very important for animal conservation.

The Japanese Marsh Warbler Locustella pryeri is endemic to the Far East and is listed as a near threatened species worldwide (IUCN 2009) and an endangered species in Japan (Ministry of the Environment 2006). The distribution of this warbler is restricted to Japan and eastern China (Kanai et al. 1993, Nagata 1997), and two subspecies are recognised as separate Japanese (L. p. pryeri) and Chinese (L. p. sinensis) populations.

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The two subspecies differ in colour: the Chinese subspecies is lighter than the Japanese subspecies (Shigeta 1991, Brazil 2009), and therefore each subspecies is believed to be a unit of conservation for this warbler. The population of the Japanese subspecies is very small, with approximately 2,500 individuals (Ueda 2003), and it has a restricted distribution with only seven known breeding sites (Kanai & Ueda 1994, Nagata 1997). Only two large breeding populations (Hotoke-numa and Tone River) are known in Japan; the others are very small (Ueda 2003). Therefore, the Hotoke-numa and Tone River populations are of critical importance in conserving this endemic species. The Hotoke-numa population is located in Aomori Prefecture, northern Honshu (40° 41′ N, 141° 22′ E), and the Tone River population is located in central Honshu, on the border between Chiba and Ibaraki prefectures (35° 51′ N, 140° 37′ E), so these two populations are separated from each other by about 600 km. However, they are thought to be the same unit of conservation because they belong to the same subspecies, although the morphological and genetic data for the two populations have never been compared. Presently, morphological information, such as body measurement data, is known only for the Tone River population (e.g., Shigeta 1991, Yamashina Institute for Ornithology 1982), but no information from the Hotoke-numa population exists. From our unpublished data on the Hotoke-numa population, body measurements may differ between these two populations. The birds from Hotoke-numa have larger body sizes in both sexes than those from Tone River. [i.e., natural wing length (mean ± SD): Hotoke-numa population, ♂: 57.6 ± 1.6 mm (n = 30 in 2007), ♀: 52.2 ± 1.2 mm (n = 24 in 2007) (Takahashi & Ebina unpublished data); Tone River population, ♂: 53.3 ± 1.0 mm, ♀: 48.8 ± 1.4 mm (Yamashina Institute for Ornithology 1982). See also Table 1]. However, the body colour of these populations has not been compared, and the warbler has not been described based on a quantitative colour measurement method. Here, we report quantitative colour measurements from the Japanese Marsh Warbler from both the Hotoke-numa and Tone River populations and compare the morphological characteristics of these two populations.

### Methods

Two adult individuals from the Hotoke-numa population and five adult individuals

<table>
<thead>
<tr>
<th>Population</th>
<th>Specimen No.</th>
<th>Sex</th>
<th>Natural wing length (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tone River</td>
<td>15148</td>
<td>M</td>
<td>54.11</td>
</tr>
<tr>
<td></td>
<td>15154</td>
<td>M</td>
<td>57.29</td>
</tr>
<tr>
<td></td>
<td>15155</td>
<td>F</td>
<td>50.88</td>
</tr>
<tr>
<td></td>
<td>15299</td>
<td>M</td>
<td>55.61</td>
</tr>
<tr>
<td></td>
<td>15301</td>
<td>F</td>
<td>50.74</td>
</tr>
<tr>
<td>Hotoke-numa</td>
<td>—</td>
<td>M</td>
<td>59.42</td>
</tr>
<tr>
<td></td>
<td>—</td>
<td>F</td>
<td>No data</td>
</tr>
</tbody>
</table>
from the Tone River population were used in this study. The samples from Hotoke-numa were collected during the 2009 breeding season. One sample was a female killed by a Sparrowhawk *Accipiter nisus*, and the other consisted of some tail feathers accidentally lost by a male during capture. The samples from Tone River consisted of three male and two female specimens from the museum collection of the National Museum of Nature and Science of Japan (N.M.N.S.), which were collected during the 2002–2005 breeding seasons. Our body measurements of these specimens fall within those found in the Yamashina Institute for Ornithology's (1982) examination of the Tone River population (see Table 1). All of these samples are valuable and very rare, first because it is not permitted to actively collect samples for colour measurements because such measurements stress living warblers during the breeding season, and second because neither the N.M.N. S. nor the Yamashina Institute of Ornithology (Y.I.O.), which house the two largest ornithology collections in Japan, have any specimens from the Hotoke-numa population (The Y.I. O. has a single Japanese Marsh Warbler specimen collected during the breeding season (Yamashina Institute for Ornithology 2010), but we did not use this specimen for our study because it was old and discoloured). We measured spectral reflectance using an Ocean Optics (Dunedin, FL, USA) USB2000 spectrometer and stored the data in a laptop computer running OOIBASE32 software (range 300–700 nm). The measurements covered both the human visible colour range and the ultraviolet range, with PX-2 (Ocean Optics) as the light source. Readings were taken from a circular area with a diameter of approximately 4 mm at a 90° angle to the sample. In addition, dark and white standard (WS-1, Ocean Optics) measurements were taken before measuring each sample. We selected four body regions (a brown region on the back, flank, tail and a black region on the tertials) and took reflectance measurements from five randomly selected areas in each body region.

**Results**

The reflectance data for each body region and population are shown in Figure 1a–d. In the Tone River population, the reflectance of females and males had the same sequence pattern and either overlapped each other or differed only slightly. The Hotoke-numa and Tone River populations had similar reflectance patterns, and the reflection data of the Hotoke-numa population overlapped those of the Tone River population or were only slightly different.

It is well known that avian vision differs from human vision (Bennet *et al.* 1994). For example, the Blue Tit *Parus caeruleus* shows sexual dichromatism in the ultraviolet colour region (Hunt *et al.* 1998), which is not visible to human eyes. However, our quantitative data on the warblers showed very little UV reflection. We believe that there is no difference in colours (including the UV region) between the two populations, although wing length differs. Future work should concentrate on describing and comparing the two populations using colour data from more individuals, and include morphological characters other than colour as well as genetic sequence data from DNA.
Acknowledgements

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References


Fig. 1. Reflectances of (a) a brown region on the back, (b) a brown region on the flank, (c) a brown region on the tail, (d) a black region on the tertials. Each individual is shown. All reflectance data were smoothed.


オオセッカの羽色に関する予備的考察：2つの地域個体群間の比較

オオセッカ Locustella pryeri は絶滅の危惧され、長く保護が図られている種である。しかし、本種の生態や形態的な特徴といった基礎的な情報の記載は未だ十分ではない。国内に存在する大規模な繁殖地として、青森県の仏沼における繁殖個体群と、茨城県・千葉県境の利根川での繁殖個体群が知られている。特にこの仏沼個体群は、利根川個体群とは翼長等の形態的特徴が異なる可能性があるが、その形態的特徴は明らかではない。そこで本研究では色彩に着目し、その特徴を記載した。少サンプルでの比較はあるが、両個体群は同様の反射傾向を示し、かつ、その波形は重複なしに同等の反射率の違いのみであった。将来的に更なる詳細な比較が必要であろう。

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