Population fluctuation and habitat preference of Ijima's Copper Pheasant Syrmaticus soemmerringii ijimae: an endemic, 'near threatened' Japanese subspecies

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Population fluctuation and habitat preference of Ijima's Copper Pheasant *Syrmaticus soemmerringii ijimae*: an endemic, 'near threatened' Japanese subspecies

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ORNITHOLOGICAL SCIENCE

Abstract Population fluctuations and habitat preferences of Ijima's Copper Pheasant *Syrmaticus soemmerringii ijimae* were investigated using a line transect method at two locations in southern Kyushu from 2002 to 2013. During the 12 years of the survey, transects were walked a total of 536 times (representing approximately 2,150 hours and a walking distance of around 3,590 km). The total number of encounters was only 127 birds, which represents one bird every 16.9 hours or 28.3 km. The number of birds encountered appeared to decrease steadily throughout the study period. The frequency of encounters was higher in evergreen and deciduous broad-leaved forests, and lower in mature cedar and cypress plantations. Therefore, it is suggested that increasing their preferred broad-leaved forest habitat would be an appropriate strategy for the recovery of the declining Ijima's Copper Pheasant population.

Key words Broad-leaved forest, Habitat preference, Ijima's Copper Pheasant, Near threatened species

The Copper Pheasant *Syrmaticus soemmerringii* is endemic to Japan where it inhabits evergreen and deciduous broadleaf forest and adjoining mixed forest with dense undergrowth and grassy hillsides in mountainous regions at elevations below around 1,300 m (Johnsgard 1999). However, detailed ecological and behavioural data on this species has not yet been obtained, as it skulks on steep, densely forested slopes (Yamaguchi & Kawaji 2003). Due to ongoing habitat loss, limited range and overhunting in some areas, the Copper Pheasant is evaluated as 'Near Threatened′ on the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species (IUCN Red List 2011), although the species is still included in the game bird list of Japan.

Ijima's Copper Pheasant *S. s. ijimae* is one of five subspecies occurring in Japan (excluding Hokkaido), and is confined to southern Kyushu. As the number of birds shot declined drastically during the 1960s, hunting of the subspecies in Miyazaki Prefecture has been prohibited since 1965 and this subspecies has been removed from the list of Japanese game birds since 1979 (Kawaji 2004). The Miyazaki branch of the Wild Bird Society of Japan (2010) suggested that a slight recovery of the wild population had occurred, but the cause(s) of this recovery and the earlier decline remain obscure.

In order to conserve Ijima's Copper Pheasant, precise population data are essential. If the wild population is continuing to decrease, then causes must be identified and addressed in order to facilitate recovery. Furthermore, to restore the wild population, the habitat preferences of Ijima's Copper Pheasant should be clarified. Armed with that information, we will be able to define a suitable population restoration strategy, such as recreating or increasing the birds' preferred habitat alongside supplemental methods, for example, releasing captive-bred birds (Kawaji et

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al. 2009). Therefore, as the basis of such plans for Ijima's Copper Pheasant, population and habitat surveys were made for 12 years (2002–2103) in the forests of southern Kyushu, Japan, and habitat preferences were derived from these results.

STUDY AREAS AND METHODS

The survey was performed at two forested locations, separated by 2–3 km, in Kitago-cho, Nichinan City, Miyazaki Prefecture, Japan: Yamagariya (around 31°44′35″N, 131°21′20″E) along a hillside in a mountainous region at an altitude of 390–455 m; and Kaichigoutani (around 31°46′19″N, 131°21′13″E) along a ravine with a stream at an altitude of 270–390 m. The latter location was chosen to compare with the former, since Kiyosu (1978) reported that Copper Pheasants may favour streamside habitats. The length of each survey trail was 6.7 km from start to finish and return (Fig. 1). The line transect method was used for the survey (Gregory et al. 2004), which was conducted approximately every two weeks (twice monthly) at each location from May 2002 to December 2013.

Most of the vegetation in these areas consisted of a mosaic a coniferous plantation and secondary forest. The vegetational environments along the census course were divided into four types: evergreen broad-leaved forest (EB), solely mature coniferous plantation (CP), deciduous broad-leaved forest (DB) and a mixture of forestry plantation and broad-leaved forest (MX). Most forestry plantations consisted of mature Japanese Cedar *Cryptomeria japonica* and, to a lesser extent, Japanese Cypress *Chamaecyparis obtusa*. The secondary forests consisted mainly of broad-leaved evergreen and deciduous trees, dominated by various Japanese oak species (e.g., *Castanopsis* and *Quercus* species) and Japanese Cherry *Prunus serrulata*, while the lower layer consisted of evergreen shrubs, such as Japanese Camellia *Camellia japonica*, Japanese Eurya *Eurya japonica* and Japanese Privet *Ligustrum japonicum*. The proportion of each vegetational environment was determined every 50 m along the survey trail. During the 12-year survey period, there was almost no substantial environmental change, such as large-scale logging.

While walking along the forest trails at around 1.5–2 km/hr (for approximately four hours), observers recorded numbers of birds, their sex, age, in relation to date and the vegetation in the vicinity of the encounter. For comparison with the actual number of birds encountered, an expected number was calculated assuming that the birds were distributed uniformly among the different vegetational environments. Statistical analyses were performed using Excel statistics 2010 for Windows.

RESULTS

From 2002 to 2013 (12 years), surveys were con-

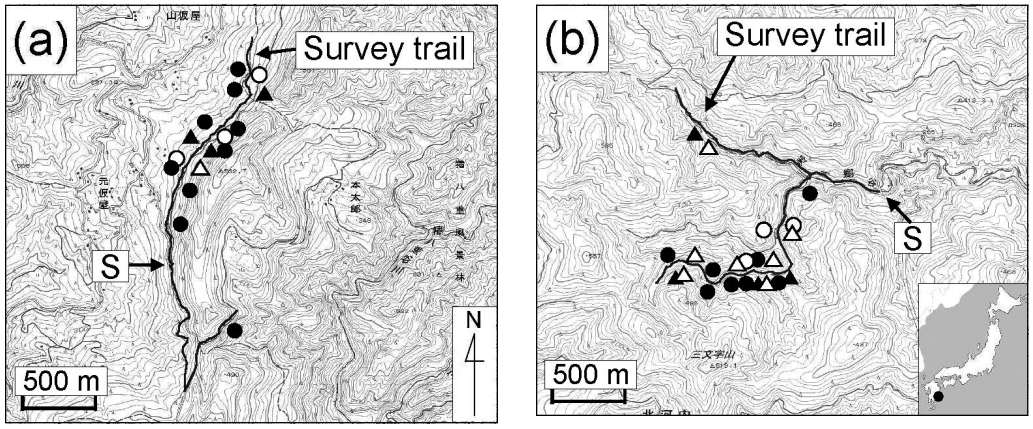

Fig. 1. Map of the survey locations in Kitago-cho, Nichinan-city, Miyazaki Prefecture, Japan: (a) Yamagariya (around 31°44′35″N, 131°21′20″E), along a hillside in a mountainous region at an altitude of 390–455 m; and (b) Kaichigoutani (around 31°46′19″N, 131°21′13″E), along a ravine stream at an altitude of 270–390 m. Yamagariya is located about 2–3 km south of Kaichigoutani. 'S' marks the start of the survey trails; the distance of the outward and return journey along each trail was 6.7 km. Points of encounters over 12 years (2002–2013) were mapped by season: spring (●); summer (○); autumn (▲), and winter (△). Three overlapping points of encounter are displayed as one mark.

ducted a total of 536 times at the two locations (representing approximately 2,150 hours and a walking distance of around 3,590 km). The total number of encounters was 127 birds: 54 at Yamagariya (hillside) (41 males, 13 females); and 73 at Kaichigoutani (streamside) (39 males, 32 females, 2 chicks), which represents one bird every 16.9 hours or 28.3 km. There was no significant difference in the annual average number of birds encountered per 10 km at Yamagariya (0.29±0.04, the mean±S.E.M.) or Kaichigoutani (0.46±0.09), although the value was higher at Kaichigoutani (Student's *t*-test, $p>0.05$ Fig. 2). Therefore, data from both locations were integrated for further analyses. The annual average number of males and females encountered appeared to decrease steadily, and the number of both sexes encountered decreased significantly (Significant test in correlation, $p<0.05$) (Fig. 3).

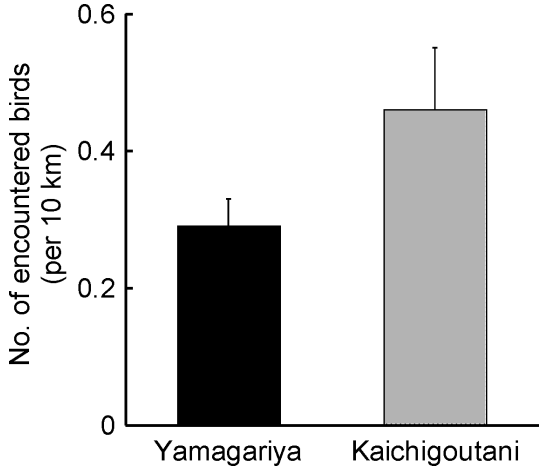

Fig. 2. Annual average encounters (per 10 km) of Ijima's Copper Pheasant at Yamagariya or Kaichigoutani (2002–2013). Each value represents the mean±S.E.M. of values for 12 years.

The vegetational composition (%) of Yamagariya and Kaichigoutani was 30.1 and 29.3 for EB, 39.6 and 28.0 for CP, 8.2 and 7.4 for DB, and 22.1 and 35.3 for MX, respectively. No significant differences were recognized between the two locations. However, when the expected encounter rate was calculated from the composition of the vegetational environment, and actual encounters at both locations were compared, there was a significant difference (Tests for goodness of fit, $p<0.01$), i.e., there were significantly more encounters in broad-leaved forests than in plantations (G-test of independence, $p<0.01$, Fig. 4).

DISCUSSION

Little is known about the habitat preference of the Copper Pheasant in Japan (Kawaji & Yokoyama 2009). The few preceding works have suggested a possible general preference for stream proximity (Kiyosu 1978), and a preference for broad-leaved forest habitat *S. s. scintillans* in the Kanto district of Honshu (Yamaguchi & Kawaji 2003). In both cases, however, the data relate to different subspecies and different vegetational environments from those found in the range of *S. s. ijimae* in southern Kyushu.

In this study, we investigated the habitat preferences of Ijima's Copper Pheasant, a 'near threat-

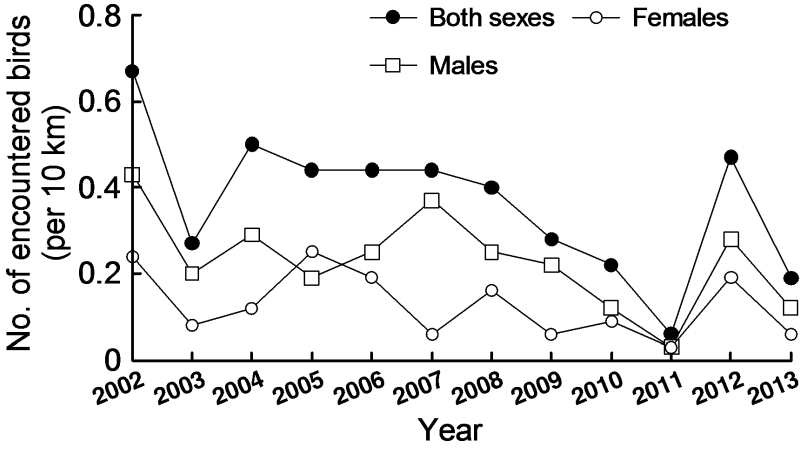

Fig. 3. Annual variation in Ijima's Copper Pheasant encounters (per 10 km) over 12 years (2002–2013) at Yamagariya and Kaichigoutani.

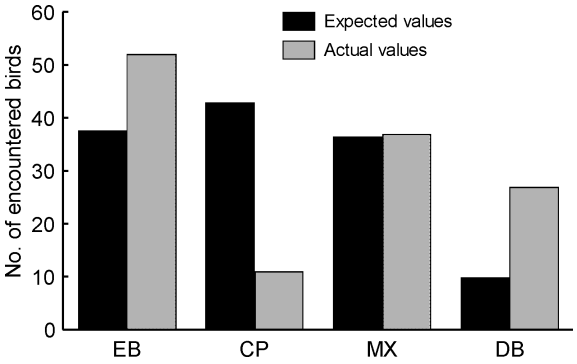

Fig. 4. Expected and actual numbers of birds encountered over 12 years (2002–2013) in the different habitats found at Yamagariya and Kaichigoutani. EB: Evergreen broad-leaved forest; CP: Coniferous plantation alone; MX: Mixed broad-leaved and coniferous forest; DB: Deciduous broad-leaved forest.

ened' endemic subspecies, in two areas with different topographies, along a hillside in a mountainous region (Yamagariya) and along a ravine streamside (Kaichigoutani). Our results showed that there was no significant difference in bird distribution between the two, and that Ijima's Copper Pheasant had no particular preference for either topography (Fig. 2). Moreover, despite large areas of coniferous trees having been planted in these study areas, Ijima's Copper Pheasant seemed to prefer evergreen and deciduous broad-leaved forest habitats (Fig. 4). These results were similar to those of Yamaguchi and Kawaji (2003).

The Copper Pheasant forages mostly on ferns, fruits and seeds, but based on crop content analysis, they also consume the fallen leaves of Japanese Larch *Larix kaempferi* and the leaves and seeds of Japanese Cedar (Kawaji & Yokoyama 2009). Thus, they use mature coniferous plantations in addition to broad-leaved forests as their feeding habitats. In southern Kyushu, there are large areas of cedar and cypress plantations, but no larch plantations, thus the pheasants may seek out broad-leaved forests as suitable foraging habitat.

The Miyazaki branch of the Wild Bird Society of Japan (2000, 2010) reported that the population density of Ijima's Copper Pheasant in Miyazaki Prefecture was 2.5 birds/km^2 in 1999 and 2.7 birds/km^2 in 2009. These values were calculated based on the forest area of the prefecture and combined the results of several line transects with information gathered from many local residents. Kubo (1978), who conducted a line transect investigation in 1968 and 1969, reported that the population density of the Copper Pheasant in broad leaved forest of Minamata, Kumamoto Prefecture, in central Kyushu was 0.92–1.84 birds/km^2. That locality may represent part of the range of Ijima's Copper Pheasant and the investigation period was coincident with the reported population decline of the subspecies. The mean population densities from our 12 years of censuses were considerably lower (1.35 in 2002 to 0.12 in 2011, mean 0.73 birds/km^2) than those described above, although the reason for the lower densities is uncertain.

We demonstrated a declining trend in pheasant numbers during the period of our research in study areas dominated by forestry plantations (Fig. 3). This decline did not seem to result from environmental change, because of the absence of any such substantial changes during the survey period. The Miyazaki branch of the Wild Bird Society of Japan (2000, 2010) estimated, from questionnaire information provided by hunters, that an increase in predators (e.g., Raccoon Dog *Nyctereutes procyonoides* and Red Fox *Vulpes vulpes*), may have disturbed the reproduction of Ijima's Copper Pheasant. However, accurate, referenced data on the annual population changes of mammals in our survey area are not available. Various carnivorous mammals as well as omnivores, such as Wild Boar *Sus scrofa* and Japanese Macaque *Macaca fuscata*, and herbivores such as Japanese Deer *Cervus nioppon* are found in these localities (Miyazaki Prefecture 2013) and would affect the pheasant population fluctuation of our study areas, as may the presence of feral cats and feral dogs. The Copper Pheasant nests on the ground and forages on the forest floor (Yamashina 1976), thus terrestrial omnivores such as wild boars and monkeys, and native and introduced predators might destroy ground nests and eat their contents, while other mammals would disturb the forest floor vegetation, which provides the nesting habitat of the pheasants.

Our results indicate that Ijima's Copper Pheasant seems to prefer broad-leaved forests. There could be many causes for the drastic decline on the population of Ijima's Copper Pheasant during the 1950s and 1960s, one of which could have been the replacement of native forests with large areas of cedar and cypress plantations, according to governmental policy during these periods (e.g., Nabeshima et al. 1996). As a result, much of the natural evergreen broad-leaved forest vegetation has been lost in favour of forestry plantations. Therefore, increasing the area of broad-leaved forests might lead to a population recovery.

Extended monitoring will provide not only more accurate data on the habitat use of the pheasants, but also on population trends; these will form the basis for establishing a rapid conservation strategy, despite the low populations established during this line transect investigation.

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REFERENCES

Gregory RD, Gibbons DW & Donald PF (2004) Bird census and survey techniques. In: Sutherland WJ, Newton I & Green RE (eds) *Bird Ecology and Conservation; a Handbook of Techniques*. pp 17–56. Oxford University Press, Oxford.

IUCN Red List (2011) The IUCN Red List of Threatened Species. Available at http://www.iucnredlist.org/ (accessed on 1 December 2013).

Johnsgard PA (1999) *The Pheasants of the World: Biology and Natural History, 2nd ed.* Smithsonian Institution Press, Washington, DC.

Kawaji N (2004) Kyushu ni okeru yamadori –shuryo ni yoru seisi no wakareme– (Turning point of life and death by hunting –the Copper Pheasant in Kyushu–). Shinrin Kagaku 41: 54–58 (in Japanese).

Kawaji N & Yokoyama J (2009) Food habits of the Copper Pheasant Syrmaticus soemmerringii in winter season. Bull FFPRI 8: 127–132.

Kawaji N, Maruyama T & Yano Y (2009) Mortality of released captive-bred Copper Pheasants in a natural refuge area of Japan. Ornithol Sci 8: 125–130.

Kiyosu Y (1978) *Nihon chorui daizukan II zouho kaitei ban* (The Birds of Japan II revised ed.). Kodansha, Tokyo (in Japanese).

Kubo H (1978) 3.6 Bird Census. In: Kita T, Ono Y & Hosokawa T (eds) *JIBP SYNTHESIS 18 (Biological production in a warm-temperate evergreen oak forest of Japan)*. pp 207–212. University of Tokyo Press, Tokyo.

Miyazaki branch of the Wild Bird Society of Japan (2000) *Heisei 11-nendo kosijiroyamadori seisoku chosa itaku houkokusyo* (The trustee reports of current status of Ijima's Copper Pheasant in 1999). MB of WBSJ, Miyazaki (in Japanese).

Miyazaki branch of the Wild Bird Society of Japan (2010) *Heisei 21-nendo kosijiroyamadori seisoku chosa itaku houkokusyo* (The trustee reports of current status of Ijima's Copper Pheasant in 2009). MB of WBSJ, Miyazaki (in Japanese).

Miyazaki Prefecture (2013) *Miyazaki-ken tokutei choju hogokanri keikaku* (Specified Wildlife Plan in Miyazaki Prefecture). Available at http://www.pref.miyazaki.lg.jp/contents/org/kankyo/shizen/choju_hogo/page00224.html (accessed on 21 May 2014).

Nabeshima M, Yoshimoto A & Yukutake K (1996) Forest resource management within the Mimigawa river basin in Miyazaki Prefecture –long term timber supply analysis in Morotsuka village–. Kyushu J For Res/Kyushu Br of Jpn For Soc 49: 1–2 (in Japanese).

Yamaguchi Y & Kawaji N (2003) Habitat use of the Copper Pheasant *Syrmaticus soemmerringii* in central Japan. Bull FFPRI 2: 193–198.

Yamashina Y (1976) Notes on the Japanese Copper Pheasant *Phasianus soemmerringii*. World Pheasant Assoc J 1: 23–42.