

短 報 (Note)

Influence of the invasion of *Leiothrix lutea* on a native avifauna in a natural beech forest on Mt. Karimata, Kyushu

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Abstract

Bird censuses were carried out in four breeding seasons, 1992 – 1995, in a natural beech forest on Mt. Karimata, Kumamoto Prefecture, western Japan. The Red-billed Leiothrix *Leiothrix lutea* has invaded there a few years before. The density fluctuations of species possibly competing with the Red-billed Leiothrix were studied. Thirty-three bird species were recorded. the Red-billed Leiothrix already colonized there, whereas the Bush Warbler *Cettia diphone* decreased in number. The density of the Coal Tit *P. ater* was stable, but that of the Great Tit *Parus major* fluctuated.

Key words : beech forest, *Cettia diphone*, introduced species, *Leiothrix lutea*, *Parus*

Introduction

The Red-billed Leiothrix *Leiothrix lutea* is native to southern China and Southeast Asia (de Schauensee, 1984). This species was imported to Japan as a cage bird at least 150 years ago and has established naturalized populations in natural forests in Honshu and Kyushu, main islands of Japan, in the 1970s and 1980s (Eguchi & Amano, 1999, 2004).

The effect of exotic species on a native bird community invaded by them can be detected by comparing its composition before and after the invasion. Though the Red-billed Leiothrix has been ecologically studied on its habitat selection, foraging niche and breeding density at several areas in Japan (Eguchi & Masuda, 1994; Tojo, 1994; Amano & Eguchi, 2002b; Tojo & Nakamura, 2004), few reports have been known about the density fluctuations of the Red-billed Leiothrix and Japanese native bird species in the same area. Eguchi & Masuda (1994) pointed out that both the Red-billed Leiothrix and the Bush Warbler *Cettia diphone* mainly utilized thick understory of forest in Kyushu. Also foraging location and foraging technique of the Red-billed Leiothrix overlapped with those of the Coal Tit *Parus ater*, the Willow Tit *P. montanus* and the Great Tit *P. major* (Eguchi & Masuda, 1994). Those native species might be affected by the intrusion of the Red-billed Leiothrix.

The author carried out bird censuses for four years on Mt. Karimata, Kumamoto Prefecture, central Kyushu, in breeding seasons several years after the Red-billed Leiothrix had naturalized. The density fluctuations of the

Red-billed Leiothrix and native bird species, of which niches may overlap wholly or partly with that of the Red-billed Leiothrix, were described.

Study site and methods

The study was conducted on Mt. Karimata (1,315 m a.s.l., 32°34' 50" N, 130°44' 30" E), lying over Misato town and Izumimachi, Yatsushiro city, Kumamoto Prefecture, at the edge of the Central Mountains of Kyushu. The first observation record of the Red-billed Leiothrix on Mt. Karimata was recorded in May 1988 (Takano, 1988).

A 2.6km trail from the foot (1,100m a. s. l.) to the top of Mt. Karimata was used as a census route (Fig. 1). The route was on a slope facing to northwest, of which inclination was about 15°. Most of vegetation around the census route was natural forest, of which canopy was predominated by beech *Fagus crenata*, followed by some conifers such as Japanese fir *Abies firma* and Japanese hemlock *Tsuga sieboldii*. The height of the canopy was about 20m. The area size of the natural forest was 70.3ha. Besides, 10-year-old planted hinoki cypress *Chamaecyparis obtusa* and 30-year-old planted Japanese cedar *Cryptomeria japonica* covered 12% and 8% adjacent to the natural forest, respectively, of the area along the census route. A thick understory of dwarf bamboo *Sasamorpha borealis* covered 80% of the ground along the census route. The height of the understory of dwarf bamboo was about 2m. The average air temperature of May, June and July were 14.1°C, 15.7°C and 18.9°C, respectively, on the foot of Mt.

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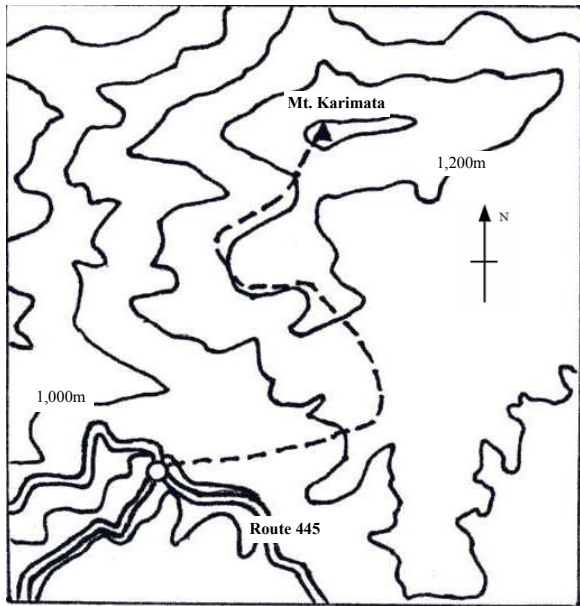


Fig. 1. Map of the study site. Dotted line indicates the census route.

Karimata (Kaminaka et al., 1987). The leaves of beech opened in middle or late April on Mt. Karimata. The annual precipitation at Kosa, which is the nearest weather monitoring point and 12km apart from Mt. Karimata, was 2,046 mm.

Bird censuses were carried out there in the breeding seasons from 1992 to 1995 during four months from April to July as follows: an observer walked along the route at a speed of about 2km per hour in sunny or cloudy morning from 5:00 to 9:00 AM. Most bird species breed there at the period of April – July. Bird censuses, which

were carried out on April as the early period of the breeding season, on May or June as the middle period of the breeding season and on July as the late period of the breeding season, were repeated in total of three times every year from 1992 to 1995. All bird species were identified within 50m from the route by direct observations, songs or calls. Young birds were excluded from the records because they do not have territories. Each flock of the same species was counted as one individual in order to evaluate the density of territories.

The bird density of each species was determined as the average number of recorded individuals per ha in each year. The dominance of each species was determined as the percentage of recorded individuals in the total number of all bird species in each year.

Results

A total of 33 bird species were recorded in four years of censuses (Table 1). The numbers of individuals per census were 48.0, 49.7, 44.0 and 47.3 in 1992, 1993, 1994 and 1995, respectively. Among them, the Red-billed Leiothrix was the most dominant, which occupied 21.0% in total of four years, followed by the Bush Warbler, 19.4%, the Coak Tit, 13.1%, and the Great Tit, 12.3%, respectively. Among understory users, the Japanese Robin *Erithacus akahige* occurred in very low frequency (Table 1). Thus, the three dominant species, the Bush Warbler, the Great Tit, the Coal Tit were assumed as the possible competitors of the Red-billed Leiothrix.

The density of the Red-billed Leiothrix was stable in high level for four years (Fig. 2). On the other hand,

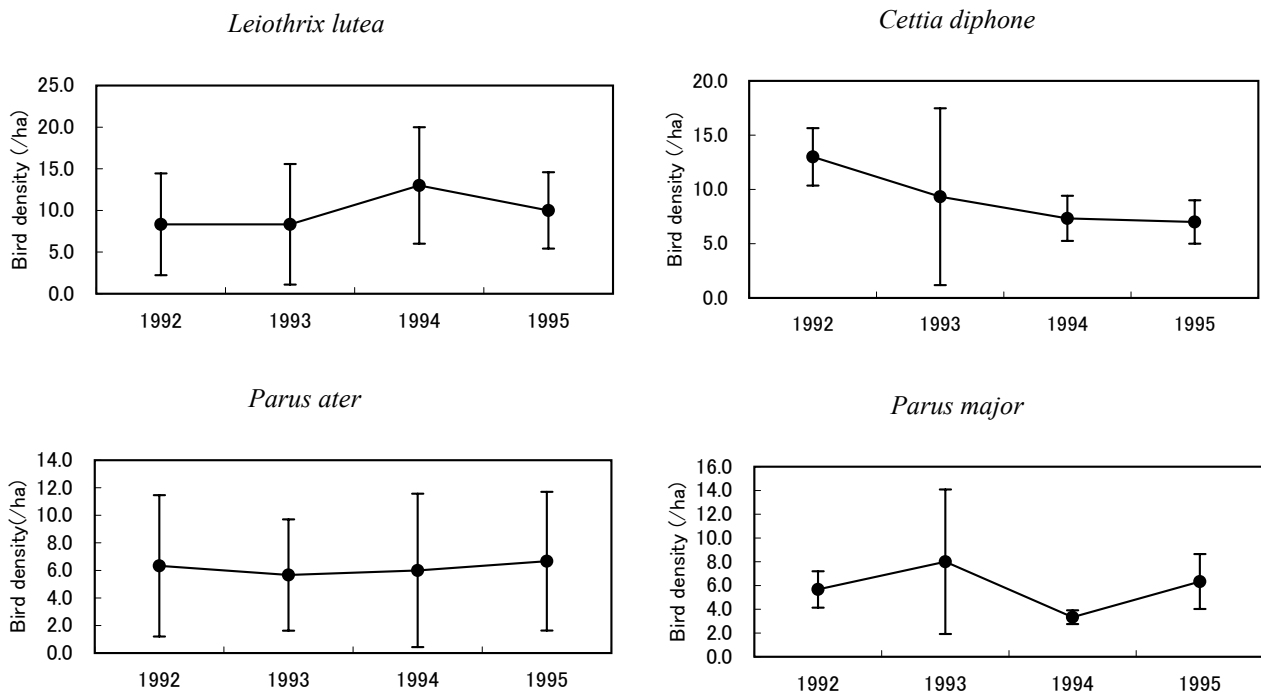


Fig. 2. Bird densities of major species on Mt. Karimata in each year. Error bars indicate standard deviations.

the density of the Bush Warbler indicated a significant decreasing tendency (Fig. 2). The density of the Coal Tit was stable, and that of the Great Tit fluctuated (Fig. 2).

Discussion

The density of the Bush Warbler was decreasing on Mt. Karimata after the Red-billed Leiothrix had colonized. It was suggested that there were interspecific interactions between the Bush Warbler and the Red-billed Leiothrix. According to the data by Yui et al. (1997) which was taken on a breeding bird community in a mixed forest over 15 years by territory mapping method, the density of the Bush Warbler did not fluctuate when the environment was relatively stable though it increased when the stand was disturbed. The data by Takano (1998) also indicated that the density of the Bush Warbler was in the range of about 20 to 40 pairs per 52 ha of the mixed forest in 30 years. Thus, the breeding density of the Bush

Warbler was considered not to change largely under the stable environment. Both the Red-billed Leiothrix and the Bush Warbler mainly utilize dense understory vegetation (Eguchi & Masuda, 1994). Due to the habitat overlap, these two species may compete with each other for their foraging niche (Amano & Eguchi, 2002b). Also it was suggested that the predatory pressure for nesting the Bush Warbler might be higher where the nesting density of the Red-billed Leiothrix was high (Amano & Eguchi, 2002a). The density decrease of the Bush Warbler might be due to the interspecific competition with the Red-billed Leiothrix or to indirect effects from predators.

There was also another bush user, the Japanese Robin recorded on Mt. Karimata. The feeding niche of the Japanese Robin might overlap partly with the Red-billed Leiothrix, though nesting niche do not overlap, because the Japanese Robin search foods on the ground to the bush layer and it makes nests on the ground (Kiyosu,

Table 1. Dominance (%) of bird species observed on Mt. Karimata in breeding season

Family	Common name	Scientific name	1992	1993	1994	1995
Phasianidae	Chinese Bamboo Partridge	<i>Bambusicola thoracica</i>				+
Columbidae	Oriental Turtle Dove	<i>Streptopelia orientalis</i>		+	3.0	+
	Japanese Green Pigeon	<i>Sphenurus sieboldii</i>	+	+		0.7
Cuculidae	Horsfield's Hawk Cuckoo	<i>Cuculus fugax</i>	+			
	Common Cuckoo	<i>C. canorus</i>	+		+	+
	Oriental Cuckoo	<i>C. saturatus</i>	0.7	+		+
	Little Cuckoo	<i>C. poliocephalus</i>	+	0.7	+	+
Picidae	Japanese Green Woodpecker	<i>Picus awokera</i>	1.4	2.0	0.8	0.7
	Japanese Pygmy Woodpecker	<i>Dendrocopos kizuki</i>	1.4	4.0	1.5	2.8
Campephagidae	Ashy Minivet	<i>Pericrocotus divaricatus</i>	0.7	1.3	1.5	2.1
Pycnonotidae	Brown-eared Bulbul	<i>Hypsipetes amaurotis</i>		0.7	1.5	
Troglodytidae	Wren	<i>Troglodytes troglodytes</i>	4.2	2.0	3.8	2.8
Turdidae	Japanese Robin	<i>Erithacus akahige</i>	+			
	Dusky Thrush*	<i>Turdus naumanni</i>		0.7		
Timaliidae	Red-billed Leiothrix	<i>Leiothrix lutea</i>	17.4	16.8	29.6	21.1
Sylviidae	Bush Warbler	<i>Cettia diphone</i>	27.1	18.8	16.7	14.8
	Arctic Warbler	<i>Phylloscopus borealis</i>	0.7		0.8	
	Eastern Crowned Leaf Warbler	<i>P. coronatus</i>		0.7		
Muscicapidae	Narcissus Flycatcher	<i>Ficedula narcissina</i>	2.8	0.7	1.5	2.8
	Blue-and-white Flycatcher	<i>Cyanoptila cyanomelana</i>	0.7			0.7
Aegithalidae	Long-tailed Tit	<i>Aegithalos caudatus</i>	2.8	5.4	0.8	4.9
Paridae	Willow Tit	<i>Parus montanus</i>	4.2	4.0	4.5	5.6
	Coal Tit	<i>P. ater</i>	13.2	11.4	13.6	14.1
	Varied Tit	<i>P. varius</i>	0.7	6.0	3.8	3.5
	Great Tit	<i>P. major</i>	11.8	16.1	7.6	13.4
Sittidae	Nuthatch	<i>Sitta europaea</i>	1.4	2.0	4.5	5.6
Zosteropidae	Japanese White-eye	<i>Zosterops japonicus</i>	0.7			
Emberizidae	Siberian Meadow Bunting	<i>Emberiza cioides</i>	4.2	2.7	1.5	1.4
Fringillidae	Bullfinch*	<i>Pyrrhula pyrrhula</i>		0.7		
	Masked Grosbeak	<i>Eophona personata</i>				+
Corvidae	Jay	<i>Garrulus glandarius</i>	1.4	2.7	3.0	1.4
	Nutcracker	<i>Nucifraga caryocatactes</i>	0.7			
	Jungle Crow	<i>Corvus macrorhynchos</i>	2.1	0.7	+	1.4

+: species recorded with the distance more than 50 m.

*: winter visitors recorded at censuses in April.

1952). The Japanese Robin might compete with the Red-billed Leiothrix, though its density was too low to evaluate the fluctuation.

The density of the Great Tit, which uses all of the layers from ground to canopy, fluctuated, but that of the Coal Tit, which uses the canopy layer, was stable. The density fluctuation of the Great Tit might be affected by the Red-billed Leiothrix because of the partly overlap of their foraging niche, though the relationship between them could not be elucidated.

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* The title is a tentative translation by the author of this paper.

熊本県雁俣山のブナ林の在来鳥類群集に対する ソウシチョウの侵入の影響

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要旨

移入種ソウシチョウが侵入して数年を経過した熊本県雁俣山のブナ天然林において、1992年から1995年までの4回の繁殖期に鳥類センサスを実施した。33種の鳥類が記録され、ソウシチョウはすでに定着していた。ソウシチョウと競合する可能性のある在来種について密度の変化をみると、ウグイスは4年間の間に減少した。ヒガラは密度は安定し、シジュウカラは密度が変動していた。

キーワード： ブナ林、ウグイス、移入種、ソウシチョウ、カラ類

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