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Song Dialect of Oriental Magpie-robin (*Copsychus saularis*) in Northern Thailand

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ABSTRACT.– Different song types were recorded from 60 males of Oriental Magpie-robin, *Copsychus saularis* Linnaeus, 1758. The survey was carried out in the provinces of Phayao and Chiang Mai, northern Thailand from April 2000 to March 2001. Spectrogram study revealed that all song types shared some common features: The song frequency ranged from 2 to 6 kHz; each completed song composed of 2 or more strophes (2-112) repetitively used; the core elements occurred within the first second of each strophe. Core element is a compartment that shared among all individuals of this species. These three characters are here recognized and considered as species recognition for the Oriental Magpie-robin. Variation of song syntaxes at the marking elements, the last element of core element groups, were found among male populations recorded from different study areas and is regarded as song dialect. Different pattern of the specific elements were presented at the terminal part of each strophe and can be considered individual variation within populations. Geographical division and learning behaviors are likely to cause differences among specific elements, leading to significant trend of song dialect of this species.

KEY WORDS: core element, strophe, species recognition, specific element

INTRODUCTION

Most bird species use vocal communication produced by the syrinx (Catchpole, 1979; Kroodma and Miller, 1982) that is controlled by song repertoire located in the auditory areas of the brain (Mello and Ribeiro, 1998). The song repertoire plays important roles in vocal perception, song formation and song development. Several studies have focused on the relative complexity of the song repertoire, especially the large and complicate repertoire of the passerine birds (Kroodma and Miller, 1982). Buchanan and Catchpole (2000) found that females of sedge warbler (*Acrocephalus schoenobaenus*) prefer males with larger repertoires. This mechanism, known as female mate choice, undoubtedly leads to successful courtship of males, and subsequently selection for larger repertoires.

Song is used for the maintenance of territorial boundaries, extra pair copulation and extra pair bonding (Mello and Ribeiro, 1998). Territorial song is used to indicate a

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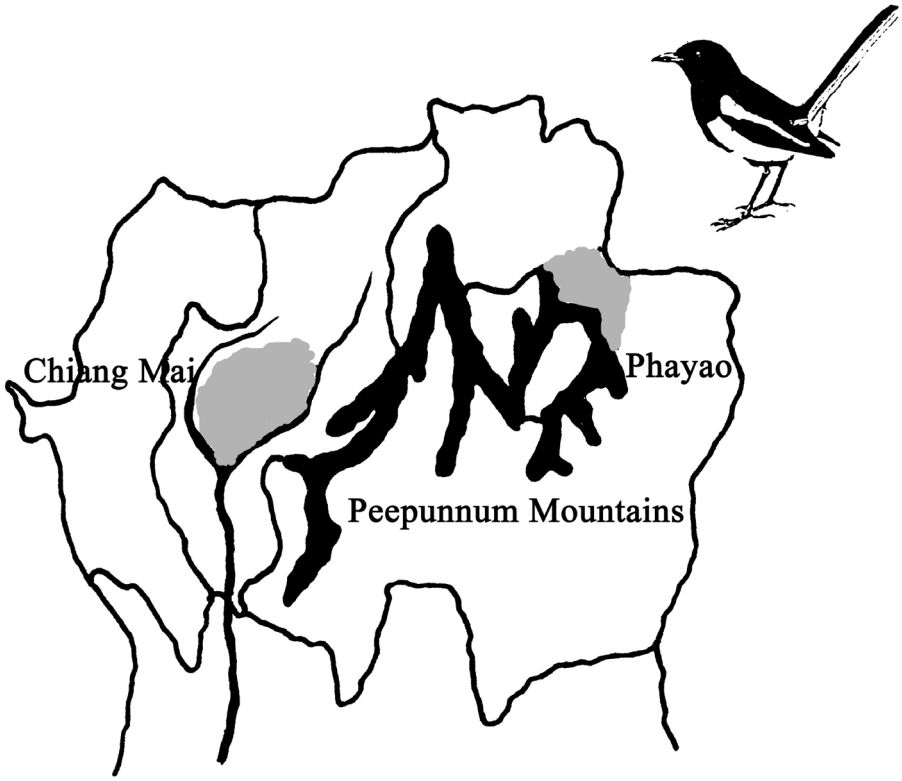

FIGURE 1. The field experiment of Oriental Magpie - robin (*Copsychus saularis*) of Northen Thailand, Chiang Mai and Phayao province.

particular area occupied by individual (Catchpole, 1979) and is often utilized during breeding season with several indecisive meanings (Fujita, 1994). Members of the same species communicate and recognize their population from the song that contains core elements, from the constant frequency of the songs and from rhythm or temporal pattern within the song (Catchpole, 1979). However, male generally establishes a unique characteristic of song with its specific elements and variable patterns of song syntaxes (Catchpole, 1979). The different pattern of songs, defined as song dialect, is commonly used for recognition between members of a family and neighbors (Catchpole, 1979; Kroodma and Miller, 1982). The song dialect is generally believed to be a result from geographical division (Glaubercht, 1989; Helb and Dieter, 1994). Separation and isolation allow bird population to develop its own distinctive array of dialects and subsequently transfer the unique patterns of songs from adults to the next generation (Thielcke, 1992; Henry and Hausberger, 1994; Wanker et al., 1998).

MATERIALS AND METHODS

The Oriental-Magpie robin, *Copsychus saularis* Linnaeus, 1758 (Muscicapidae), is a widespread resident species inhabiting

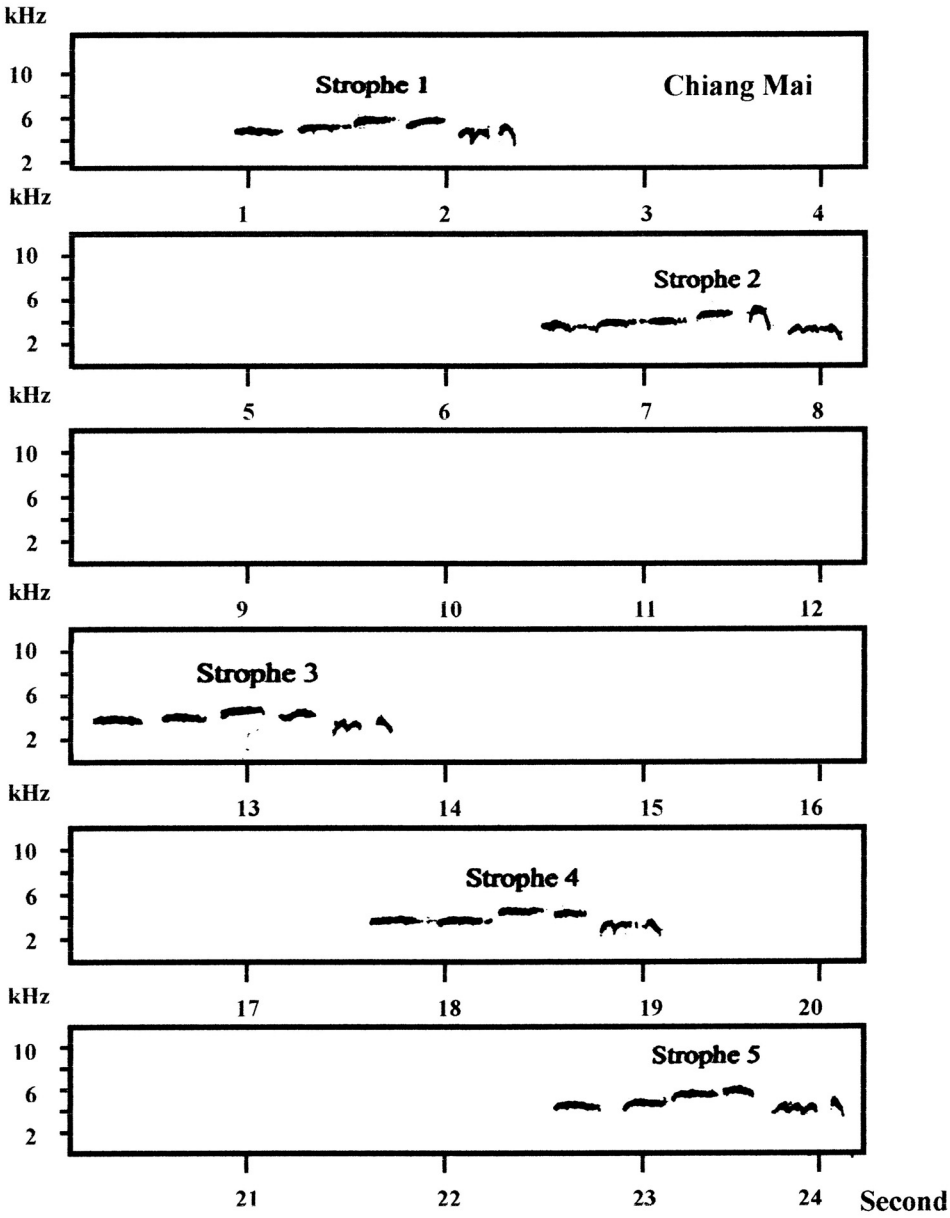

FIGURE 2. Sonagram of a completed full song of Oriental Magpie - robin recorded from Chiang Mai province.

lowland forests below 1800 m of Southeast Asia and the East Indies Archipelago (Lekagul and Round 1991; Khobkhet, 1998). The territories defended by the monogamous pairs of this species ranges from 1 to 2 km^2 (Lekagul and Round, 1991).

Sixty males of this species were studied from two geographically isolated populations in Northern Thailand. Phayao

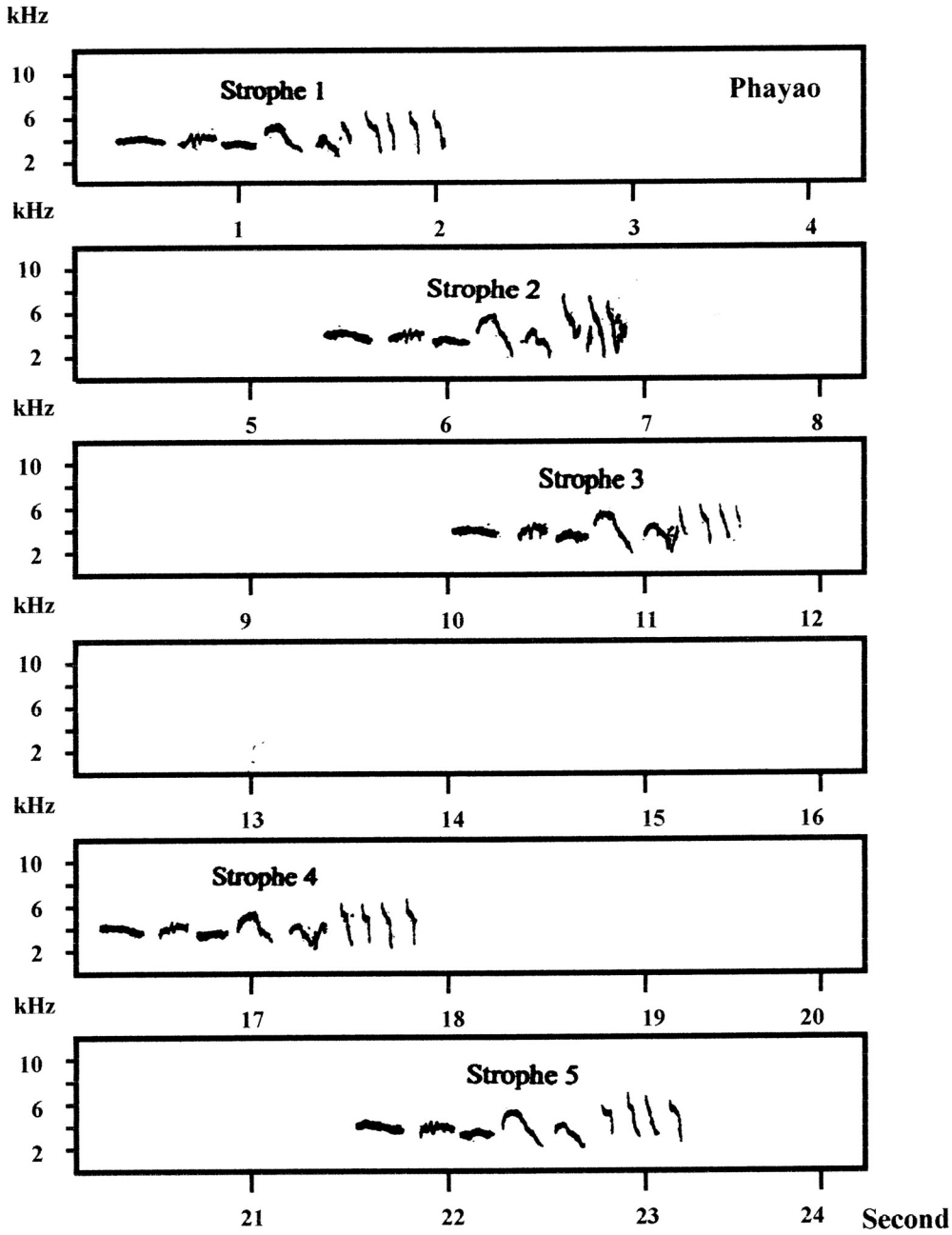

FIGURE 3. Sonagram of a completed full song of Oriental Magpie-robin recorded from Phayao province.

Province is separated by alignment of the Peepunnam Range and locates roughly 250 km direct distance from Chiang Mai City (Fig. 1). For each locality, songs and behaviors of thirty males were recorded and observed into non–breeding season

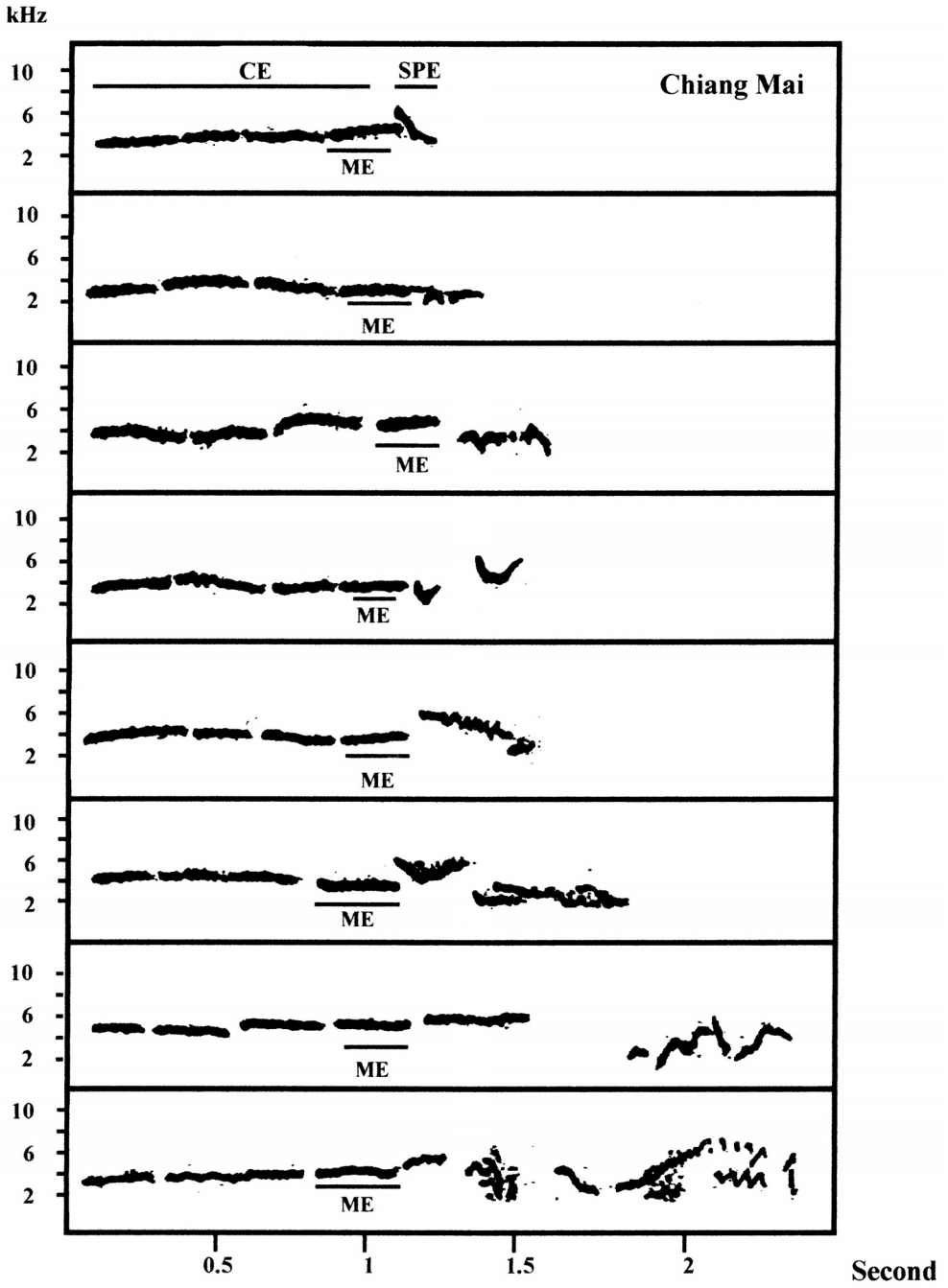

FIGURE 4. Sonagrams of eight individuals recorded from Chiang Mai provinces. CE= core element; ME= marking element; SPE= Specific element.

(May 2000 to December 2000) and breeding season (January 2001 to April 2001), each male was recorded three times a season (early morning, in the afternoon

and in the evening). Thirty males of ChiangMai province were recorded in January 2001 to Fabuary 2001 and Phayao province in March 2001 to April 2001 respectively. Recorded songs from parabolic reflector, dynamic microphone (Telinga Pro 4B, Sweden) and tape cassette recorder (SonyTCM-200DV, Japan) were then transferred to spectrometer and analyzed for song structure by AVISOFT® at the frequency of 10 kHz. Sonagrams from each individual were generated and interpreted. AVISOFT® program was use to translate song to sonagrams (www. avisoft.com/ (Avisoftbioacoustics Breite StraBe 20A 13187 Berlin, German)).

RESULTS

General features of song

The positions of 60 males were performed by territorial map. It was found that male can be sang more than two difference songs. However, all songs ranged in frequency ranging from 2 to 6 kHz. Songs were complex i.e., each song contained several strophes (Figs 2, 3). Two or more strophes were repeatedly used to synthesize a single song (minimum of 2; maximum of 112). The mean length of each strophe was 2.07 ($\pm$0.12 is standard deviation) seconds, but there was nosignificant difference (ANOVA test, $n=60$, $p<0.05$) between Chiang Mai and Phayao province. The strophe generally consisted of 6.70 ($\pm$0.40) elements, including core elements and specific elements, the fine and complexity structure of song appearing at the end part of strophe (Fig. 4). The strophe always started with the core elements called 'introductory whistle' that appeared within the first second of each strophe and was followed by the specific elements at the terminal part (Fig. 4).

Characteristics of the core elements and marking element

The core elements appeared as a group of bands whose frequency did not vary (Figs 4, 5). The core elements ranged from 2 to 6 kHz and consisted of 3.83 ($\pm$0.46) elements at the beginning of each strophe. The last element of the core element is referred to here as the 'marking element' (Figs 4, 5). The marking element can be easily distinguished between the two populations, with the marking element of Chiang Mai population appeared as a horizontal band (Fig. 4, lower bar) whereas those observed from Phayao province represented by a band with a descending end (Fig. 5, lower bar).

Characteristics of the specific elements

The specific elements of Oriental Magpie-robin appeared at the terminal part of each strophe. The specific elements generally contained one or more elements, which lasted for 0.5 to 2 seconds (Figs 4, 5; SPE). The actual structures of the specific element are the prime importance for showing the song difference among populations more than among individuals with populations.

DISCUSSION

Comparison of sonagrams obtained from Chiang Mai and Phayao provinces revealed both similarities and differences among population in song syntax. Each

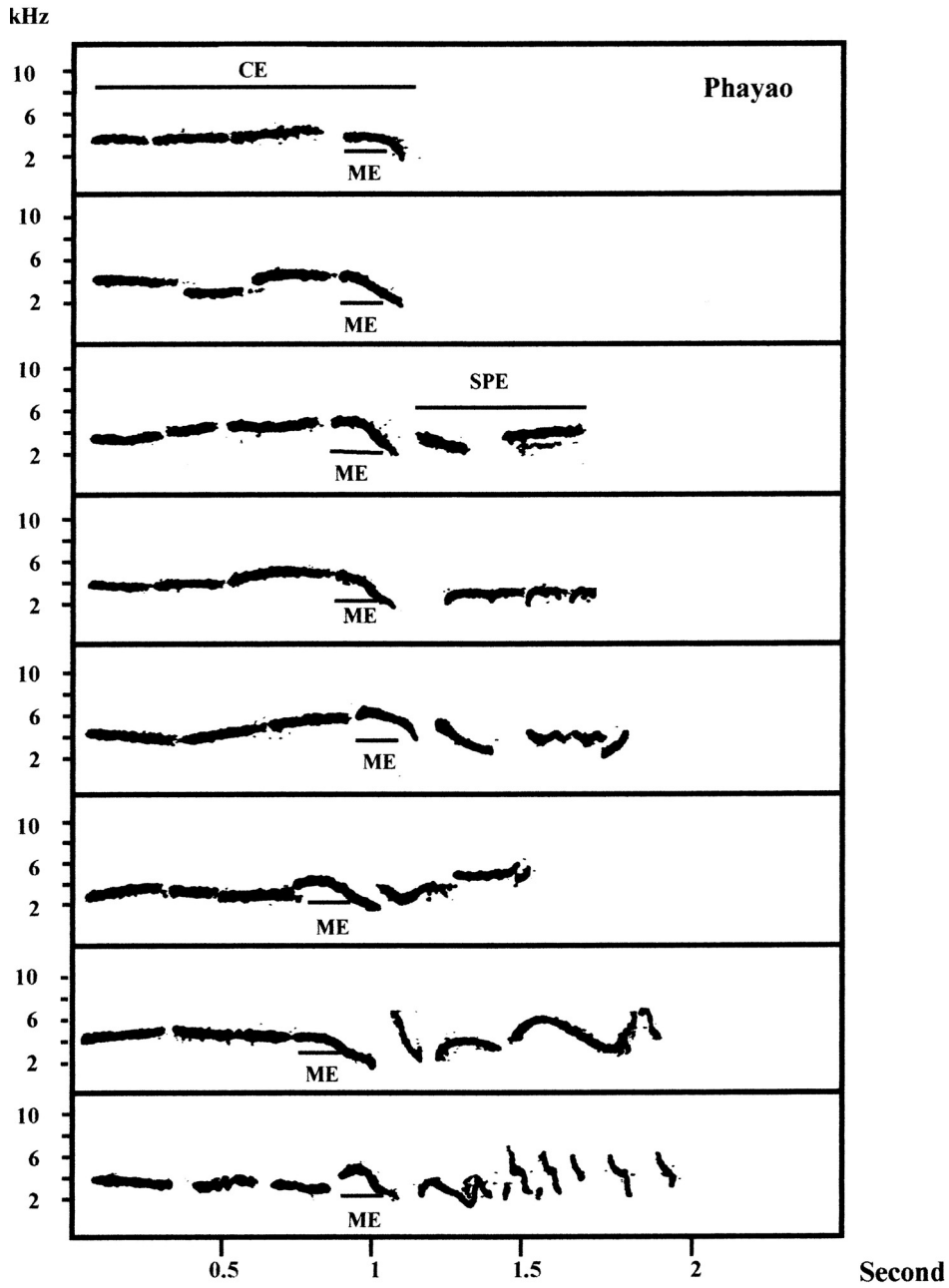

FIGURE 5. Sonagrams of eight individuals recorded from Phayao provinces. CE= core element; ME= marking element; SPE= Specific element.

song was composed of 2 to 112 strophes repetitively used. The specific frequency of the song (2 to 6 kHz) and the pattern (e.g. horizontal bands at the beginning of each strophe) of its core element group can be considered as species recognition for the

Oriental Magpie-robin, and there are high similarities among populations. Brémond (1968) first distinguished species recognition in European robin, *Erithacus rubecula*, by recognizing specific frequency of its song, which ranges from 4 to 7 kHz. The song frequency recorded from the Oriental Magpie-robin is more or less similar to the European robin but with broader range and started with relatively low frequency (~3 kHz). Comparing to the Oriental Magpie-robin, the song of Bonelli's warbler, *Phylloscopus bonelli*, is also simple and consists of 10 elements forming a trill (Brémond, 1970).

The marking element is the last element of the core element group. The presence of the marking element is a phenomenon used for distinguishing between the two populations and is here regarded as species dialect. In contrast to previous records where the specific elements were used to recognized song dialect, the present study utilizes the marking element to represent song dialect. Glaubercht (1989) reported the prime importance of specific element at the end part of strophe and used this part to designate the song dialect of yellow hammer, *Emberiza citrinella*. Marler and Tamura (1964) used the variation in the pattern of introductory whistle, the fine structure of the trill in the strophe to identify the pattern of dialect of white-crowned sparrow, *Zonotrichia leucaphrys*. Alternatively, Martens and Steil (1997) used the number and character of elements and song syntax to identify the song dialect of lesser whitethroat, *Sylvia curruca*.

Several studies have shown that geographical division influences on the song syntax in each population and causes the difference in territorial songs (Glaubercht, 1989; Martens and Meincke, 1989; Helb and Dieter, 1994; Jesse, 1994; Martens et al., 1994; Martens and Steil, 1997). The present study suggested that there were significant difference between the two populations of the Oriental Magpie-robin. The dissimilarity is a result of alternation and variation in some elements, specifically the marking element of the core elements instead of the specific elements. Although males use the core elements to recognize their species and the marking element among their population, they also establish some specific elements using different patterns of song syntaxes to produce a unique characteristic of song that show variation within the same species (Figs 4, 5). Specific elements are often used to determine the degree of song difference in each population group and are important for communication between males and their neighbors in each population area, particularly in territorial defense and pair mating (Beme, 1994; Bigot et al., 1994; Fujita, 1994). The alteration of specific element was observed in males that had social interaction with their neighbors (Henry and Hausberger, 1994; Wanker et al., 1998; Norby et al., 1999).

The unique pattern of song can be transferred from adults to younger generation. It is believed that passerine bird has ability to learn and evolve its own distinctive array of songs that have evolved within certain species, becoming the significant trend of song dialect that exists within them (Catchpole, 1979; Packert et al., 2001).

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