INTERSPECIFIC COMMUNICATION BETWEEN THE COMMON MYNA (*ACRIDOTHERES TRISTIS*) AND THE WHITE-VENTED MYNA (*ACRIDOTHERES GRANDIS*)

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ABSTRACT

Sharing information about predators is a vital importance for birds that live in flocks. The Common myna (*Acridotheres tristis*) and the White-vented myna (*Acridotheres grandis*) usually live together in the same foraging and roosting flocks. Interspecific signals that could transfer crucial information between species need some similar structures for decoding the signals. Alarm and pre-flight calls of mynas were recorded when they were disturbed by human presence. Distress calls were recorded when the birds were captured from mixed-species foraging flocks. The structures of distress, alarm and pre-flight calls of mynas were analysed by using maximum frequency, minimum frequency, call length and bandwidth. Latent time of neck stretching and head turning behaviour were used to analyse the response of the birds. The results showed that the sonograms for distress, alarm and pre-flight calls for both species indicated high, medium and low levels of similarity. All sounds were interspecific communication, but alarm and pre-flight calls may carry more species specific elements than distress calls. This finding suggests that mynas could use distress, alarm and pre-flight calls to transfer crucial information in mixed-species flocks.

Keywords: Common myna; White-vented myna; distress calls; alarm calls; pre-flight calls

INTRODUCTION

Animals get benefits from living with group members by receiving essential information. Groups of animals may be composed of different species that are able to share crucial information about resources or predators (Goodale *et al*., 2010). Therefore, the ability of members to communicate about the risk of predation are important to group living species (Krams, 2010). They could recognize antipredator calls when they live in the same area and have the same predators (Hurd, 1996). In addition, gathering information from other individuals may take a shorter time than their own samplings. They may observe alarm signals and copy their companions' decision for avoiding predators (Morand-Ferron *et al*., 2010).

Interspecific signals such as the distress and alarm calls of birds are the signals that they use in potentially harmful situations. The information may transfer between species such as, alarm calls that can communicate between mammal and bird (Rainey *et al*., 2004) or between species of birds

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(Fallow & Magrath, 2010). As well as, distress calls that can communicate between mammal and bird (Wise *et al*., 1999), or between species of birds (Marler, 2004). Pre-flight calls are a type of calls that birds may use when they flee from predators, so it could transfer to species within a group of birds. In bird species, interspecific signals need some similar structures that birds can decode between species (Aubin, 1991). However, some species could respond to the calls of other species even though they have different acoustic features (Curé *et al*., 2010).

Transferring information about predators could occur in sympatric species of birds. The Common myna (*Acridotheres tristis*) and the White-vented myna (*Acridotheres grandis*) are sympatric species that live in the same habitat in Thailand. They may use some signals to share information in foraging and roosting time. Survival is important to mixed species of birds, so any signals that relate to risk situations could be interspecific signals. Many researches have described interspecific signals of distress and alarm calls, but have not considered pre-flight calls. Therefore, the vocal characteristic of distress, alarm and pre-flight calls and the responses of mynas on these signals were investigated in this study. This paper clarified interspecific communication in sympatric species of mynas in Thailand. The research supports the use of bioacoustic stimuli that could elicit the responses of birds in the mynas' repellent project.

MATERIALS AND METHODS

Sound Recording and Sound Analysis

The data were collected between January-July 2017. Behavioural observations, sound recordings and playback experiments were conducted between 6.00- 18.00 hr. The survey areas of the Common myna (*Acridotheres tristis*) and the White-vented myna (*Acridotheres grandis*) were around paddy fields and parks at Naresuan University and Chiang Mai province. Common myna and White-vented myna were captured by using a mist net (mesh size 3x3 cm.), then distress calls were recorded when a bird was held in hand. Pre-flight calls were recorded when the birds were released. Otherwise, pre-flight calls were recorded when birds were fleeing from human presence. Alarm calls were recorded when humans approached the birds or came near to their group members. Bird sounds were analysed by using Raven Pro. V.1.5. Call structures of myna species were compared by using t-test (Distress calls, n = 7; alarm calls, n = 10; pre-flight calls, n = 10). The structures of each call composed of maximum frequency (kHz), minimum frequency (kHz), call length (second) and bandwidth (kHz).

Experiments and Experimental Analysis

The best quality of the sound recordings were chosen for playback experiments. Distress, alarm and pre-flight calls were recreated to be 1-minute in length. Distress, alarm and pre-flight calls of the Common myna were 114, 60 and 118 elements respectively and White-vented myna were 92, 72 and 78 elements respectively. The stimuli were set at 80 dB, 5 seconds fade in and out with silent 5 seconds at the beginning of the sounds. Video camera (Sony Handicam, HDR-XR260) and Loudspeaker

(Deccon, PWS-210) were used to connect with a sound player (Apple ipod) and set at 20-40 meters away from the bird flocks. Three stimuli of Common Myna were tested on White-vented myna flocks. While, three stimuli of White-vented myna were tested flocks of the Common myna. The experimental controls were testing the calls on the same species, i.e., Common myna calls on the Common myna.

All stimuli were tested in 10 replications, including random birds, date and time (total 120 cases) for avoiding the same individual. The pattern of bird responses and latent time (second) of head movement behaviour were recorded. The head movement behaviour is a part of scanning strategies in vigilance behaviour of birds (Fernandez-Juricic, 2012). The pattern of head movement in this study composed of neck stretching and head turning respectively. Latent time (second) of the head movement were compared between treatment and control. MyStat freeware program was used for t-test analysis.

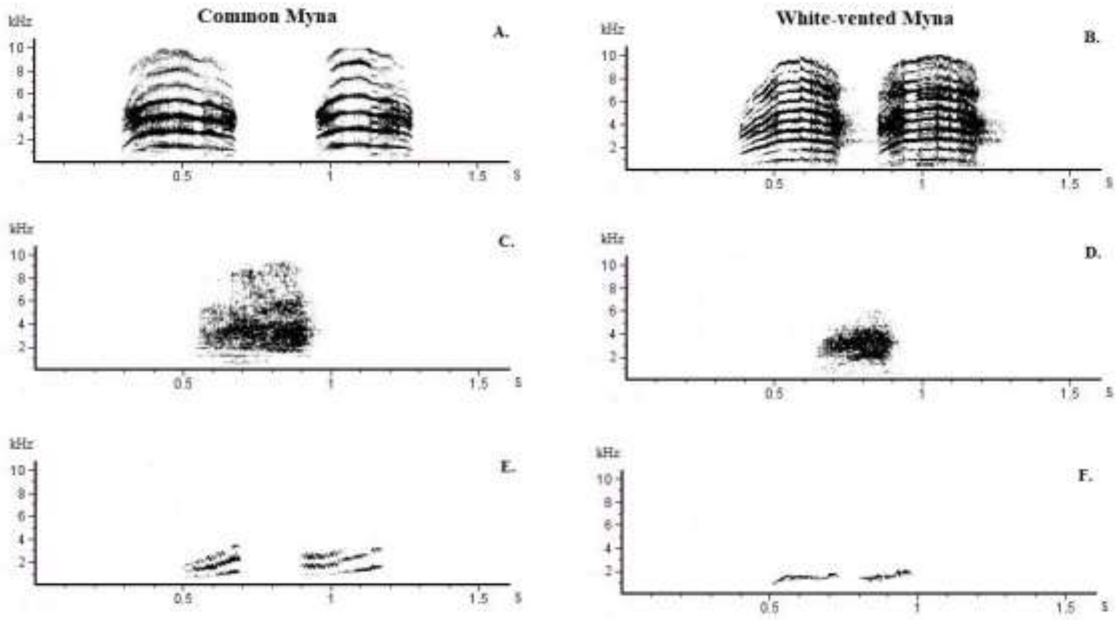

Figure 1 Elements of distress alarm and pre-flight calls in Common myna (*Acridotheres tristis*) (A, C, E) and White-vented myna (*Acridotheres grandis*) (B, D, F).

RESULTS AND DISCUSSION

Structures of Mynas' Calls

Distress calls of both species were scowl-curve shape with harmonic up to 10 kHz (Figure 1). The call structures of Common myna and White-vented myna, were described respectively. The maximum frequency was 2.895 and 2.574 kHz, respectively (P = 0.147). The minimum frequency was 1.784 and 1.440 kHz, respectively (P = 0.06). Call length was 0.419 and 0.416 kHz, respectively (P =

0.968). Bandwidth was 1.111 and 1.134 kHz, respectively (P = 0.888). Call structures of both species were not significantly different (Table 1).

Alarm calls were harsh-banded shape (Figure 1). The call structures of Common myna and White-vented myna were described respectively. The maximum frequency was not significantly different (5.078 and 4.863 kHz, P = 0.441). While, the minimum frequency was significantly different (1.372 and 1.715 kHz, P < 0.01) and call length was also significantly different (0.621 and 0.371 kHz, P < 0.01). But bandwidth was not significantly different (3.706 and 3.130 kHz, P = 0.098) (Table 1).

Pre-flight calls were frizzy-line shape (Figure 1). The call structures of Common myna and White-vented myna were described respectively. The maximum frequency was significantly different (2.549 and 2.043 kHz, P < 0.01). The minimum frequency was significantly different (0.912 and 1.083 kHz, P < 0.05). Call length was not significantly different (0.150 and 0.399 kHz, P = 0.143), but bandwidth was significantly different (1.637 and 0.960 kHz, P < 0.01) (Table 1).

Table 1 Structure of distress, alarm and preflight calls in mynas.

Structures of sounds	Common myna		White-vented myna		*P* value
Distress calls (*n*=7)	**Mean**	**SE**	**Mean**	**SE**	
Max. frequency (kHz)	2.895	0.182	2.574	0.099	0.147
Min. frequency (kHz)	1.784	0.115	1.440	0.118	0.060
Call length (second)	0.419	0.025	0.416	0.064	0.968
Bandwidth (kHz)	1.111	0.102	1.134	0.122	0.888
Alarm calls (*n*=10)					
Max. frequency (kHz)	5.078	0.049	4.863	0.268	0.441
Min. frequency (kHz)	1.372	0.029	1.715	0.098	0.004
Call length (second)	0.621	0.014	0.371	0.033	0.000
Bandwidth (kHz)	3.706	0.060	3.130	0.324	0.098
Pre-flight calls (*n*=10)					
Max. frequency (kHz)	2.549	0.078	2.043	0.024	0.000
Min. frequency (kHz)	0.912	0.049	1.083	0.040	0.016
Call length (second)	0.150	0.018	0.399	0.162	0.143
Bandwidth (kHz)	1.637	0.086	0.960	0.053	0.000

Responses of Mynas to the Stimuli

The sound stimuli conveyed predatory recognition in both myna species. The results were described in two response patterns. The birds responded to the stimuli by stretching the necks followed with turning of the heads. Fernandez-Juricic (2012) explained that birds have a different view of the visual field due to the position of their eyes on the side of the head, therefore the quality of monitoring for predators entails considerable head movements, to find possible predators. The latent period of the posture of neck stretching and head turning were recorded. This result revealed that they already recognized the risk of predation as presented by loud speakers, the responses of birds were compared using statistical *t*-test analysis.

Primary Responses

Distress calls of the White-vented myna made alerted the Common myna to the possible presence of danger. The Common myna responded by stretching the neck and turning the head quickly in the first period. The latent time of neck stretching and head turning of birds were treated as a control. Neck stretching responses to the distress calls were not significantly different (P = 0.575), but the alarm calls were significantly different (P < 0.01) and the pre-flight calls were significantly different (P < 0.01). Head turning responses to the distress calls were not significantly different (P = 0.711), but the alarm calls were significantly different (P < 0.01) and the pre-flight calls were significantly different (P < 0.01). The results showed that the Common myna responded to the distress calls of the White-vented myna in the same way as the calls of their own species. There may have been a bit of a delay when tested with alarm and pre-flight calls (Table 2).

Table 2 Responses of Common myna in each stimuli.

Behaviours	Sounds	Latent time (s)				P
		Treatment (n=10)	SD	Control (n=10)	SD	
Neck stretching	Distress calls	1.553	0.740	1.373	0.666	0.575
	Alarm calls	5.244	4.134	1.285	0.963	0.009
	Pre-flight calls	4.694	3.226	1.656	0.810	0.010
Head turning	Distress calls	3.630	1.393	3.404	1.290	0.711
	Alarm calls	9.843	7.691	2.526	1.035	0.008
	Pre-flight calls	8.411	5.621	2.866	2.313	0.010

The latent time of neck stretching and head turning were treated in the White-vented myna as a control. Neck stretching that was in response to the distress calls was not significantly different (P = 0.569), the alarm calls was not significantly different (P = 0.493), but the pre-flight calls were significantly different (P < 0.01). Head turning in response to the distress calls were not significantly different (P = 0.451), the alarm calls were not significantly different (P = 0.141), but the pre-flight calls were significantly different (P < 0.01). The results showed that White-vented myna responded to the distress and alarm calls of the Common myna as same as their own species, but they may have a bit of a delay while tested with pre-flight calls (Table 3).

Secondary Responses

Both myna species exhibited the same pattern of behaviour when they received the distress calls. Most of them immediately flew to other areas. The structures of distress calls of both species had high similarity and the flying responses were similar in both species. In terms of distress call function, they may use to warn conspecific or elicit mobbing behaviour (Hill, 1986; Branch & Freeberg, 2012), to startle or distract predators (Gochfeld, 1981; Wise *et al*., 1999; Neudorf & Sealy, 2002) or attract secondary predators (Koenig *et al*., 1991).

Mynas followed the same pattern of behaviour when they received the alarm calls, but some of them were flying to other areas after the primary responses. They may have assessed the level of threat from group members before making their decision to fly up. The medium similar shape of the alarm calls may affect the flying response. However, learning may be a factor in bird responses. For example, some species may not have alarm calls in their own species, but they could learn to respond the alarm calls of other species (Griffin *et al*., 2005). In general, alarm calls serve multiple functions that depend on situations, but major function is antipredator (Marlar, 2004). They could carry information about degree of threat (Sommer *et al*., 2012) or type of predators (Payakkhabut, 2012), but may not necessarily concern the identity of the individual bird that gave the call (Charrier *et al*., 2001).

Table 3 Responses of White-vented myna in each stimuli.

Behaviours	Sounds	Latent time (s)				*P*
		Treatment (*n*=10)	SD	Control (*n*=10)	SD	
Neck stretching	Distress calls	1.150	0.357	1.271	0.555	0.569
	Alarm calls	1.940	0.673	2.241	1.180	0.493
	Pre-flight calls	3.361	2.251	1.380	0.520	0.014
Head turning	Distress calls	2.745	1.058	2.406	0.904	0.451
	Alarm calls	7.479	7.612	3.718	1.267	0.141
	Pre-flight calls	6.336	3.654	2.976	0.859	0.011

Pre-flight, distress and alarm calls have a similar influence on the behaviour of birds. Although, a few bird flew away to another area after they presented their primary responses, most of them continued feeding or roosting after receiving the pre-flight stimulus. Low similar shape of pre-flight calls may affect responses. Furthermore, they may take the time to assess the members' activities before taking flight. Generally, pre-flight calls are pre-departure sounds that could be used in normal or risk situations. Birds produce pre-flight signals to synchronize their flight (Marler, 2004). They may show pre-flight signals as the threshold of excitability by visual displays (Black, 1988) or vocal signals (Abraham, 1974).

In a flock of birds, interspecific information may affect the temporary or stable group (Goodale *et al*., 2010). Distress, alarm and pre-flight calls are important to stable-roosting flocks and temporary-foraging flocks of mynas. In the past, Aubin (1991) reported that using synthetic distress calls were successful in stimulating the response of birds by keeping significant parameters of the stimulus. Researchers used the benefits of interspecific responses on distress calls to perform repellent stimuli in roosting, nestling, landfill sites or vineyards in many species (Pearson *et al*., 1967; Brough, 1969;

Berg *et al*., 2005; Cook *et al*., 2008; Conklin *et al*., 2009). There are some reports from using alarm calls in bird repellent experiments (Berg *et al*., 2005; Conklin *et al*., 2009), but pre-flight calls were less used in repellent stimuli.

CONCLUSION AND RECOMMENDATION

Common myna (*Acridotheres tristis*) and White-vented myna (*Acridotheres grandis*) use distress, alarm and pre-flight calls to transfer information in foraging and roosting flocks. The shapes of distress, alarm and pre-flight calls were high, medium and low similar, respectively. Both species responded to all signals, so these were the evidences of interspecific communication. However, the latent time may be different in alarm and pre-flight calls that mean they carried more species specific than distress calls. The meaning of other sounds that birds use in the mixed-species flock could be developed in further.

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