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The Interspecificity of Distress Calls

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Abstract

It is widely accepted that birds respond best to distress calls given by their own species. There is little information available however, which evaluates the effect of inter and intraspecific distress calls. During 1997 and 1998, distress calls from sub populations which are unfamiliar to local birds of the same species were assessed in Hong Kong and the U.K. Results were examined on a taxonomic basis. Response was found to be greater when con-specific calls were used. Response rates declined further as taxonomic relatedness decreased. Unlike other studies, distress calls of UK birds were effective on the same species in Hong Kong, suggesting that dialect may be less important than previously thought.

Aims

The evaluation of existing distress call recordings against a variety of species of decreasing relatedness, will allow us to determine whether it is appropriate to use existing calls for bird dispersal at airfields or whether new recordings are required to successfully disperse foreign species.

Introduction

The use of distress calls as a primary method of bird dispersal has been well documented since the early 1950's (Frings & Jumber, 1954). High intensity bio-acoustic signals are produced by birds when placed under severe stress, e.g. during capture by a predator. (Frings & Jumber, 1954). A wide variety of species including gulls (Larus spp.), corvids (Corvus spp.), starlings (Sturnus spp) (Aubin, 1986), Lapwing (*Vanellus vanellus*) and several small passerines (Greig-Smith, 1982) produce these calls. It is now well understood and documented that many of these species can be dispersed by broadcasting the appropriate species call. (Brough, 1968; Bridgman 1980).

The use of distress calls offers a theoretical advantage over most other bird scaring techniques as it entails the use of avian 'language' to which there seems to be an innate response (Bridgman, 1980). Evidence that intraspecific distress calls elicit the greatest response when broadcast is also well documented (Aubin 1990; Bremond et al, 1968; Morgan & Howse, 1974). Gulls have been shown to react well to the distress calls of other species whilst starlings are less likely to respond (Busnel & Giban, 1960). It is however, not clear how a target species response changes as it becomes more distantly related to that of the broadcast distress call.

Regional differences in dialect are already well established in bird song (Cramp 1992). There have, however, been conflicting results from studies concerned with understanding the effect of distress call dialects from conspecific birds in different locations. Blokpoel (1976), suggested that the distress call of a Eurasian Starling (*Sturnus vulgaris*), trapped in American failed to disperse starlings in England. Calls collected in Holland, France and America however, have produced normal response patterns when broadcast to the appropriate species in Britain (Brough, 1968).

Current research has generally been directed towards developing synthetic calls and assessing the degradation of calls over greater distances. The similarities between the distress call structure of different species have continually been examined over the past decades (Busnel & Giban, 1960, 1968; Stefanski & Falls, 1972).

This study, carried out by the Central Science Laboratory's Bird Strike Avoidance Team, aims to assess the effect of conspecific distress calls from different continents and to determine whether response rates show a significant decrease as relatedness diminishes.

Methods

Experimentation was undertaken in both the U.K. and Hong Kong. In the U.K., flocks (>5 birds) of five species of free living birds (Black-headed gull (*Larus ridibundus*), Herring gull (*Larus argentatus*), Lapwing, Rook (*Corvus frugilegus*) and Starling (*Sturnus vulgaris*)), were located in agricultural habitat between June and August 1998 within a 35 mile radius of the Central Science Laboratory, Yorkshire, England. Habitat features, distance to flock, bird species and the numbers present were recorded. The flock was then subjected to the distress call of a given species. Calls were broadcast using a customised portable megaphone (Scarecrow Patrol™, made by Custom House Group Ltd, East Sussex), with pre-programmed calls of the target species and an adaptation to broadcast non U.K. recordings from a portable DAT machine (Digital tape player). Broadcasts were played from a stationary vehicle for 90 seconds, during which the behaviour of the species within the flock was observed and scored out of 100 using the following criteria;

Alert	(Initial reaction of birds; time taken to look up)	10	
Lift	(Speed and proportion of flock that took off)		10
Approach	(Extent to which flock approached loudspeaker)	10	
Hold	(Length of time flock remained overhead)		10
Disperse	(Time taken and proportion of birds evacuating test area)		60

A perfect score accrued when birds took off as soon as the broadcast began, approached the megaphone directly, remained over the speaker for the length of the broadcast, and dispersed well away from the speaker once the broadcast was terminated.

Testing was also carried out in the New Territories, Hong Kong, principally at Tsim Bei Tsui and Long Valley near Sheung Shui in February and November 1997. Some testing of gull species and their distress calls was carried out at sea, from a boat. The methodology used for broadcast and assessment of calls in Hong Kong was otherwise identical to that used in the U.K.

Results

Overall response scores varied from 5 to 98 out of the total score of 100. 296 flocks containing one or more of the five target species were subjected to distress calls from the same species, genus, family and order (fig.1.). This included 18 Hong Kong and 10 U.K. flocks of Black-headed gulls, and 5 Hong Kong and 12 U.K flocks of Herring gulls which were subjected to UK conspecific calls.

Table 1.

Relatedness of Test Species to Different Distress Calls Used

Related-ness	**Black-headed Gull**	**Eurasian Starling**	**Lapwing**	**Herring Gull**	**Rook**
Con-specific	Black-headed Gull	Eurasian Starling	Lapwing	Herring Gull	Rook
Con-generic	Herring Gull	Black-necked Starling		Black-headed Gull	
Same family		Crested Myna			
Same order	Lapwing	Rook	Herring Gull	Lapwing	Eurasian Starling, Crested Myna, Black-necked

					Starling
Different order	Eurasian Starling	Herring Gull	Crested Myna	Eurasian Starling	Herring Gull

Table 2.

Number of Tests Performed for Each Call and Species Combinations Considered

Flock spp.	Distress Call Broadcast							
		Bhgull	Hgull	Lpwing	Stling	Rook	CMyna	BNStl
	Bhgull	28	18	11	10	-	-	-
	Lpwing	-	11	12	10	-	-	-
	Stling	-	11	-	11	10	10	10
	Hgull	10	17	5	8	-	-	-
	Rook	11	20	11	15	21	14	12

Key to species

(Bhgull = Black-headed Gull, Hgull = Herring Gull (*Larus argentatus*), Lpwing = Lapwing, Stling = Eurasian Starling, Cmyna = Crested Myna (*Acridotheres cristatellus*), BNStl = Black-necked Starling (*Sturnus nigricollis*))

Relationship of flock size and habitat to response score

No significant difference was observed between the total response score out of 100 and either the habitat type, (Spearman's rank correlation $r = 0.026$, $p = 0.663$), or the number of birds in the flock, ($r = 0.026$, $p = 0.658$). Flock size varied between 5 and 1200 birds (mean = 94.5, SE = 7.89).

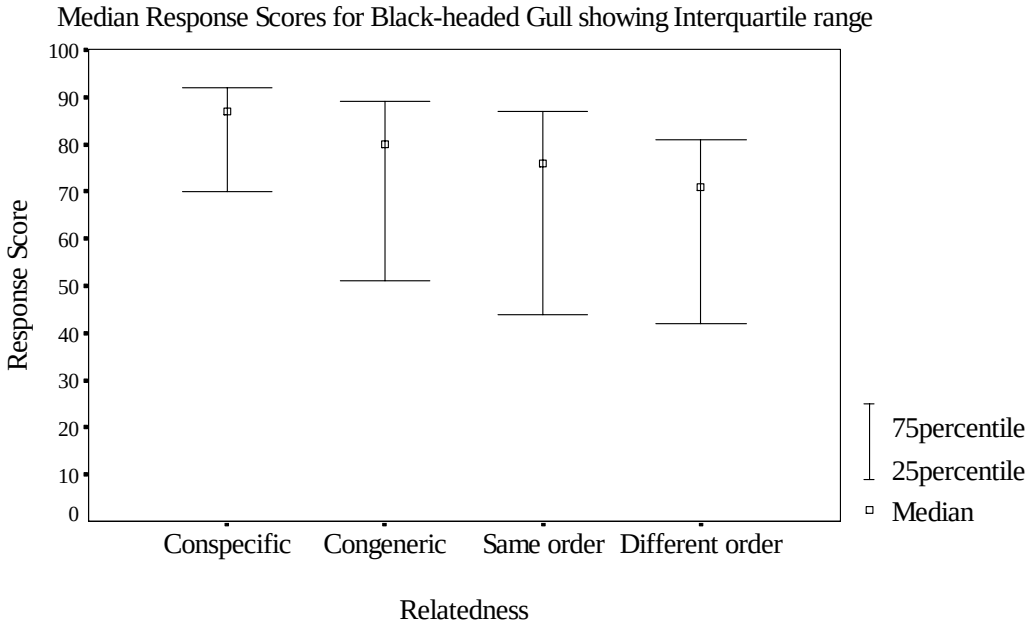
Distance of flock from distress call broadcast, overall response rates and species composition

The distance from which each flock was from the broadcast distress call ranged from 20 - 250 metres (Mean = 82.14m, SE = 2.4). Analysis of the effect of distance on flock response proved inconclusive. Response scores varied between 5 and 98 out of 100 (Mean = 65.84, SE = 1.45). Mixed flocks of some bird species responded to distress calls significantly better than flocks of a single species composition (Mann Whitney Z = 2.788, p = 0.0053). There was no significant difference in the response scores between mixed and single species flocks for Herring gull, Rook, Lapwing and Eurasian Starling. Black-headed gull responded better when in a mixed flock than in a single species flock (Mann Whitney Z = 2.212, p = 0.034).

Response of known species to inter and intraspecific distress calls

Black-headed Gulls

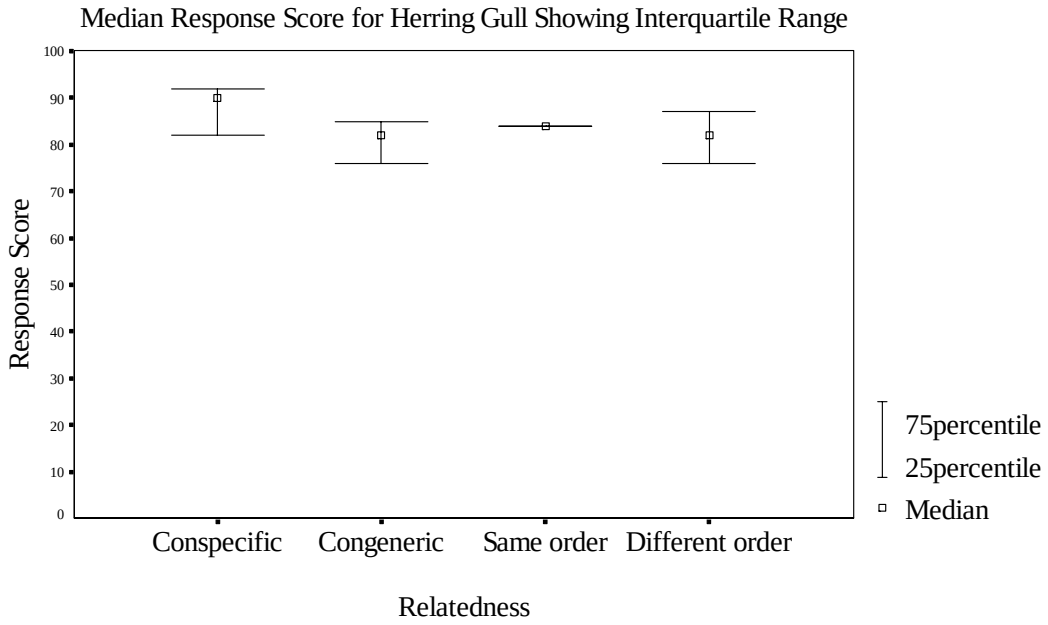
Figure 1



Black-headed gulls responded significantly better to conspecific than congeneric distress calls (Mann Whitney Z = 3.174, p = 0.002). No significant difference was noted between the calls of congeneric and more distantly related species from the same and different orders (Z = 0.496, p = 0.62 and χ^2 = 0.246, p = 0.62). Black-headed gulls in the U.K. and Hong Kong both responded successfully to the distress calls taken from a bird of U.K. origin (median scores; UK = 91/100, HK = 67/100). However, the response from U.K. Black-headed gulls tested was significantly better than the response from the same species tested in Hong Kong (Z = 3.192 and χ^2 = 10.190, with p = 0.001 in both cases).

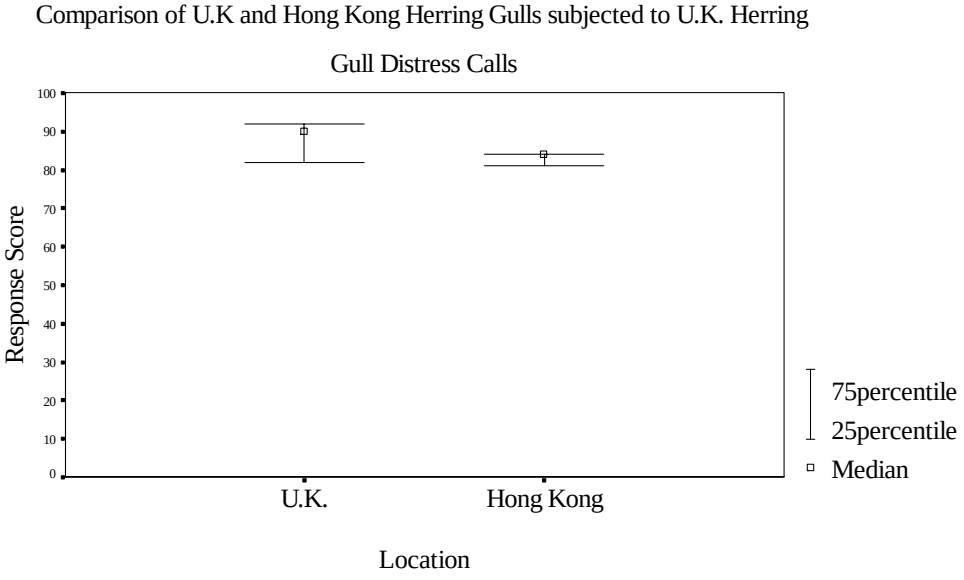
Herring Gull

Figure 2.



Herring gulls were not evaluated against same family calls. They did however, respond well to all distress calls trailed. Response was significantly better for conspecific than congeneric calls (Mann Whitney Z = 2.405, p = 0.0162). No significant difference was observed between any other relationships with Herring gulls, including conspecific and different order calls (Z = 1.9053, p = 0.0567).

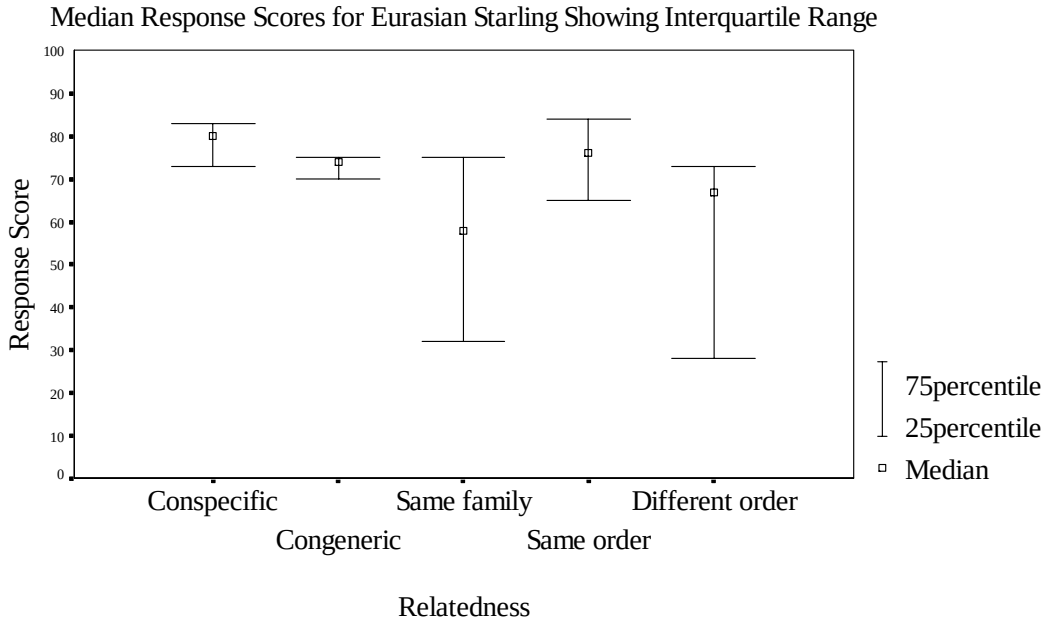
Figure 3.



No significant difference was observed between the response of U.K and Hong Kong Herring gulls to U.K. recorded Herring gull distress calls. (Mann Whitney Z = 1.579, p = 0.114, n = 24)

Eurasian Starling

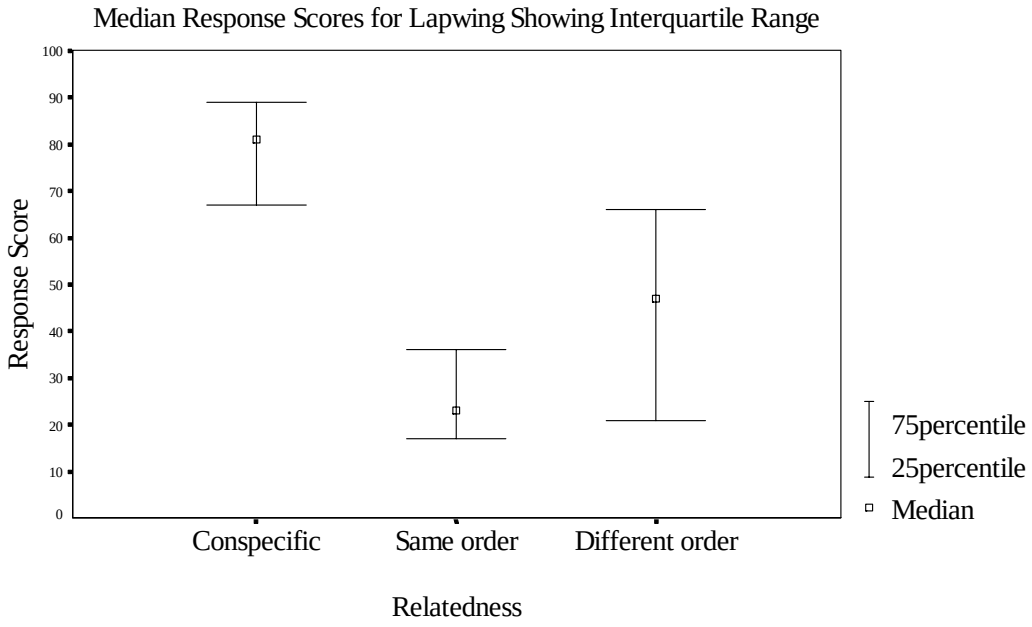
Figure 4.



Distress calls were examined at all five levels of relatedness to Eurasian Starling. A significant decrease in the response rate was observed between conspecific and all other calls excluding those from the same order (Conspecific and congeneric calls Mann Whitney Z = 2.265, p = 0.024; conspecific and same family calls, Z = 2.371, p = 0.018; conspecific and same order calls, Z = 0.670, p = 0.503; conspecific and different order calls, Z = 2.727, p = 0.006).

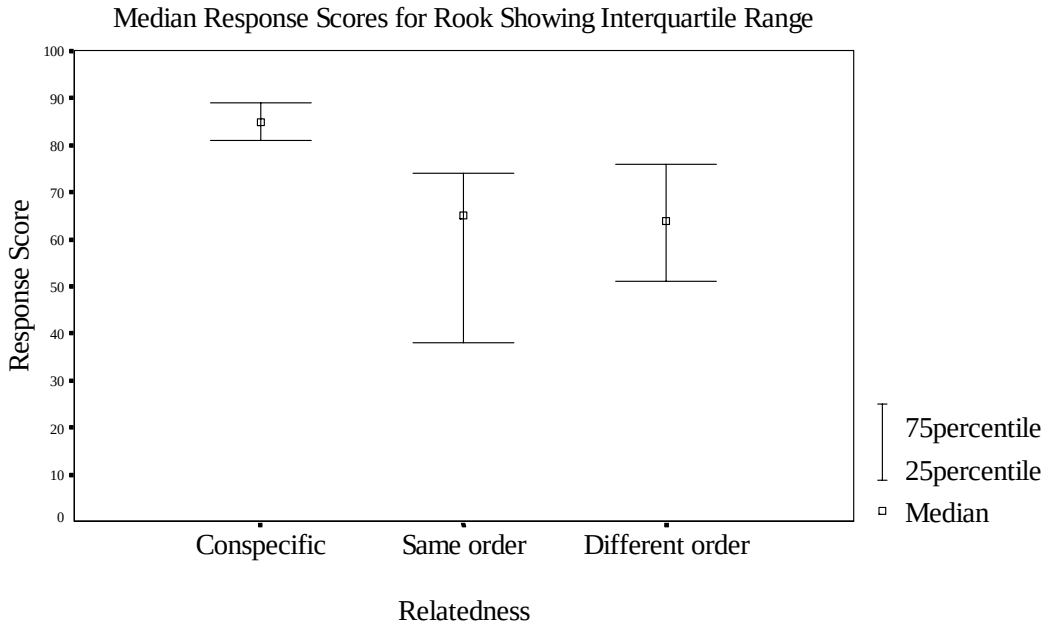
Lapwing

Figure 5.



Lapwings were not tested against congeneric or same family calls. A significantly better response rate to conspecific calls was accrued than occurred from same order species (Mann Whitney Z = 3.523, p = 0.0001). No significant difference was observed between the scores gained for same and different order species (Mann Whitney Z = 1.174, p = 0.240). There was no significant difference in the response of Lapwings to two different order species from different continents; Eurasian Starling and Crested Myna (Kruskal Wallis χ^2 = 1.61, p = 0.205).

Rook
Figure 6.



Rooks were not tested against congeneric or same family calls. A significantly better response to conspecific calls than more distantly related species was observed (Kruskal Wallis χ^2 = 35.997, p = 0.0001). A highly significant difference was observed between the response to conspecific and same order signals (Mann Whitney Z = 5.783, p = 0.0001). No significant difference was observed between the response to the distress calls of Eurasian Starling, Black-necked Starling and Crested Myna (Kruskal Wallis χ^2 = 3.162, p = 0.206).

Discussion

Typical distress call responses were witnessed in many cases suggesting that birds were responding to the broadcasts and not just treating it as an unfamiliar loud noise. Species did, in general, react significantly better to the broadcast of conspecific followed by congeneric calls. There was little difference in response beyond the level of genus.

The reaction and response of the different species of birds varied considerably. Gulls and corvids gave very positive responses to most calls, particularly those of conspecifics. Birds would react swiftly to the broadcast, approach the sound source soon after the start and subsequently disperse some distance away following cessation of the call. The reaction of Lapwings produced a much more varied response. Birds would in general follow the same response pattern as the gulls and corvids, however, they would sometimes fly directly away after the broadcast began and on occasion, ignore the broadcast completely. Starling flocks rarely approached the sound source and would not hold overhead for any length of time. Once birds had become alert to the broadcast they would frequently fly directly away or perch on nearby wires until the call had ceased. It is important therefore, to note

the substantial difference in the methods employed by different species when responding to distress calls.

U.K. Black-headed gull distress calls created a significantly better response score in the U.K. when compared to the same species in Hong Kong. Hong Kong Black-headed gulls still scored highly however, and dispersed following the broadcast , thus suggesting that dialect is relatively unimportant and birds are able to recognise the specific sounds of a distress call and respond appropriately. Hong Kong Herring gulls responded successfully, and showed no significant difference to the reactions of those in the U.K. It can be concluded therefore, that dialect may affect different response rates to distress calls in the same species, but it does not influence appropriate end reaction.

The willingness of geographically separate conspecifics to depart from an area when the distress call used was recorded in a foreign country, contradicts the findings of Blokpoel (1976), that dialect differences prevented birds from one area from responding to calls from conspecifics in another. The findings of this report therefore correlate well with those of Norris and Stamm (1965) who claimed that it was safe to assume that distress notes produce an inherent response and that the same species from different parts of the world should thus be able to recognise the appropriate call.

The data show that there is clearly a potential for using existing distress call recordings to control the same species or closely related species elsewhere in the world. For example, distress calls of the european Black-headed Gull can be used against the same species in south east Asia and are likely to be reasonably effective against closely related species in the same area. E.g. The Silver gull (*Larus novaehollandiae*) in Australia.

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