RESPONSES OF RING-NECKED PHEASANT CHICKS TO CONSPECIFIC CALLS

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ABSTRACT

RESPONSES OF RING-NECKED PHEASANT
CHICKS TO CONSPECIFIC CALLS

by Gary Heinz

Comparisons were made of the locomotor responses of 10-to-20-hours-old ring-necked pheasant chicks to eight tape-recorded pheasant calls and two controls (no sound and white noise). The vocalizations of the subjects were related to their locomotor behavior in response to taped pheasant calls and controls.

The brood-gathering call of the hen pheasant and the content call of the pheasant chick elicited strong approach responses from subjects, when compared to the effects controls and other calls had on locomotion. The alarm call of the adult male pheasant and the squeak call of the hen reduced the locomotion of subjects, usually causing them to silently crouch. Other taped calls (hiss, brood caution, fright, and flock) elicited neither strong approach nor significant inhibition of locomotion from subjects. The use of the flock call by subjects indicated that it probably functions as a care-soliciting call to the hen, rather than as a signal to other chicks.

The responses of subjects to conspecific calls indicated that these calls may be of significant survival value to chicks in the wild.

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By

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INTRODUCTION

The vocalizations of ring-necked pheasants (Phasianus colchicus) are discussed in various life-history studies (Allen, 1956; Beebe, 1931; Bent, 1932; and Leffingwell, 1928). Heinz and Gysel (1970) review what is known about this bird's vocal repertoire and describe the sound-spectrographic structure and likely function of each call.

Calls could be particularly important to pheasant chicks since the young have a long association with the hen and since other forms of communication are less well suited for use by pheasants; vision is limited by the dense cover these birds inhabit, and olfaction is poorly developed in birds. Young galliforms may respond by approach or retreat (Collias and Joos, 1953) or by a lack of movement (Watson and Jenkins, 1964) to conspecific calls. The calls of the young may also be important indicators of their inclination to locomote in response to conspecific calls (Collias, 1952).

Because of dense cover and lack of control of variables, it is difficult in the field to observe and quantify either the locomotor responses of pheasant chicks to conspecific calls or the relationship between a chick's own vocalizations and its locomotor behavior. For this reason, a controlled laboratory study was designed to make measurements of chick behavior which would answer the

the following questions: (1) what are the locomotor responses of ring-necked pheasant chicks to adult and sibling calls, and (2) how do the vocalizations of a chick relate to its own locomotor behavior in response to another pheasant's calls?

By correlating answers to these questions with knowledge of the circumstances under which various pheasant calls are given in the field, it should then be possible to state the survival value of vocal communication to ring-necked pheasant chicks in the wild.

MATERIALS AND METHODS

Subjects

Subjects were ring-necked pheasant chicks hatched from eggs purchased at the Mayer Pheasant Farm in Brighton, Michigan and the Arend Pheasant Farm in Saline, Michigan. Eggs were incubated in a David Bradley Model 228.736 forced-draft incubator at 99 1/2 ^{o}F and 85% relative humidity and were turned at least 3 times a day. The incubator was checked several times each day to determine the hatching time of each chick. Chicks were hatched and kept together in the incubator without food until they were tested on the sound to which they had been randomly assigned. Twenty different subjects were tested on each sound. At no time did chicks have the opportunity to hear the vocalizations of adult pheasants. To compare the performance of game-farm chicks to that of chicks from the wild, fifteen eggs were collected from nests in southern-Michigan fields; these eggs were incubated the same as the game-farm eggs.

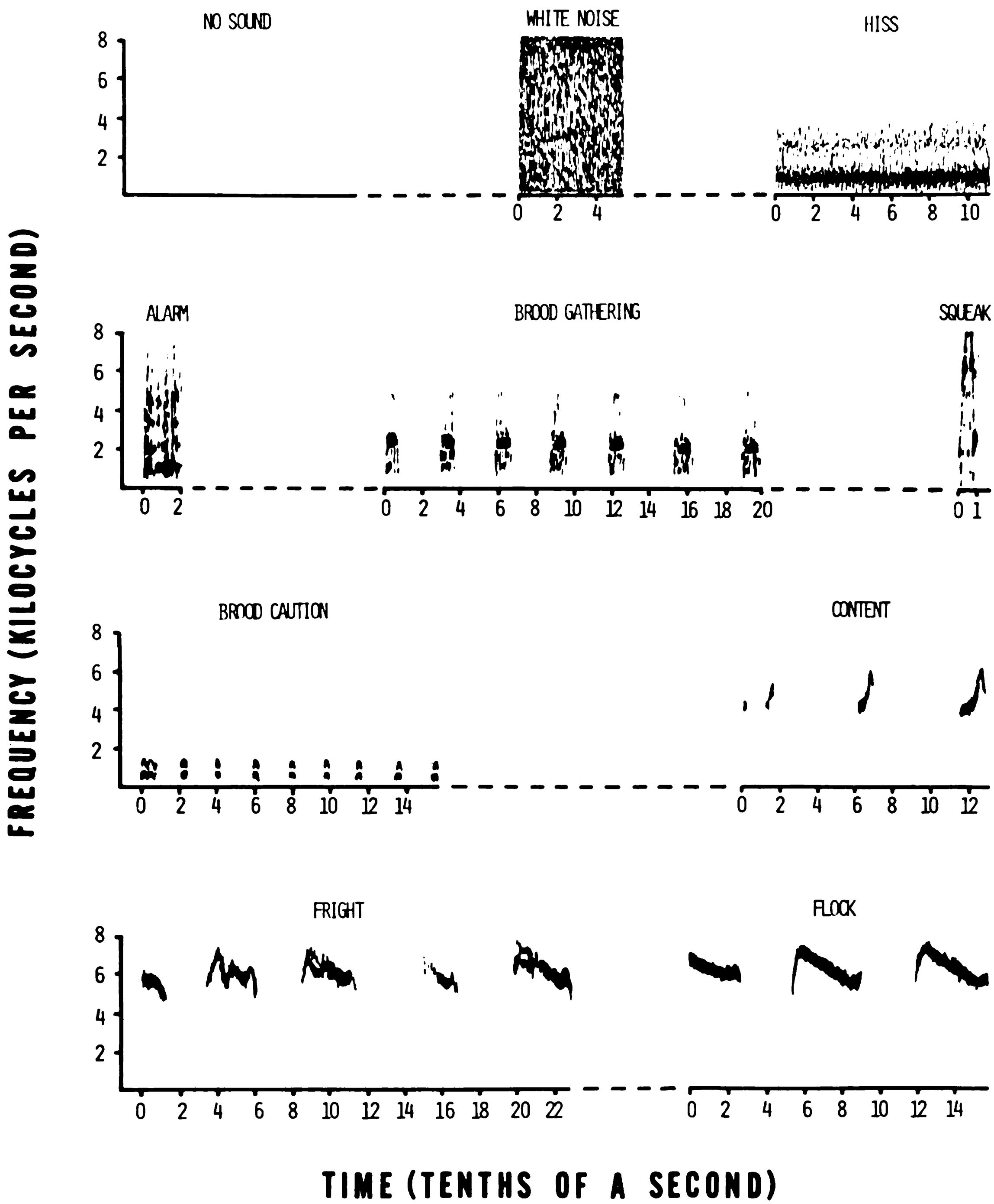
Test Sounds

Eight calls of young and adult pheasants, white noise, and "no sound" comprised the list of test sounds played to subjects. Subjects tested with the control "no sound" were tested in silence to give a base line of exploratory behavior in the test apparatus. The second control, white noise (a combination of all frequencies up to 20,000 cycles per second at equal intensities), was recorded on tape from the output of a Grason-Stadler Model 901 B Noise Generator. Pheasant calls were recorded from the field or from penned birds. Each sound was placed on a separate loop of tape with 1.5 seconds of silence between the end of the sound and its beginning. Sound spectrographs of the test sounds are shown in Figure 1. All sounds were played at a maximum intensity of 67 ± 3 db (re. 0.0002 dynes/cm^2) at the location where subjects were positioned for testing. Ambient sound level at this location was 50-58 db. Sound levels were determined by a Brüel and Kjaer Type 1613 sound-level meter on linear setting. A Uher 4000-L Report tape recorder was used to record pheasant calls from the field and from pens and to play the sounds through the loudspeakers in the test apparatus.

<u>Test Apparatus</u>

The test apparatus was an L-shaped cardboard box lined with 5/8-inch-thick acoustical tile and gray egg flats to provide insulation from sound and to reduce echoes (Figure 2). The top was covered by egg-flat lined flaps which could be opened, and the floor was covered with 1/2-inch-thick white foam rubber to give the chicks a good footing. The inside dimensions of each arm of the box were 55 cm in length, 26 cm in width, and 40 cm in height. At the end of each arm a Quam 8C6PAXK 8-inch

Figure 1. Sound spectrographs of the test sounds played to ring-necked pheasant chicks.



NO SOUND
WHITE NOISE
HISS
ALARM
BROOD GATHERING
SQUEAK
BROOD CAUTION
CONTENT
FRIGHT
FLOCK
FREQUENCY (KILOCYCLES PER SECOND)
TIME (TENTHS OF A SECOND)

Figure 2. A cutaway diagram of the apparatus in which ring-necked pheasant chicks were tested.

loudspeaker was centered 15 cm above the floor; the speakers were housed in insulated boxes of 5/8-inch acoustical tile and were covered in front only by egg flats.

A 25-W incandescent light bulb, located 30 cm above the floor halfway down each arm, provided light and heat. To measure the temperature inside the apparatus, a thermometer was extended to within 25 cm of the floor through the roof above the starting location for the subjects. The temperature was kept at 29 ± 2 °C.

To permit one-way observation of the behavior of subjects, a 4-cm wide strip of muslin-covered glass was located 3 cm above the floor along the front of each arm of the apparatus.

Procedure and Scoring

Subjects were removed from the incubator 10 to 20 hours after they had hatched and were carried in a 9-cm square by 18-cm high egg-flat lined box to the test apparatus. A subject was placed at the starting location at the junction of the two arms and was left undisturbed for 60 seconds. It was then played one of the test sounds from one of the speakers.

A subject was considered to have made a locomotor response if it crossed, within an arbitrarily set time period of 5 minutes, a plane halfway down either arm of the apparatus. An approach response was scored if the subject crossed the plane in the arm of the apparatus toward the sound, and a retreat response was scored if the subject crossed the plane in the arm away from the sound. A subject could also fail to score either an approach or a retreat response if it remained in one spot or, as was more rarely the case, walked about but did not cross halfway down either arm within 5 minutes. Testing was stopped on a subject if it failed to approach or retreat on the first trial. If a subject did respond to the sound with an approach or retreat within 5 minutes, the sound was stopped, the type of response (approach or retreat) was recorded, and the time which had elapsed from the start of the sound to the response (latency of response) was recorded. This subject was then picked up and returned to the starting location for another trial; the sound was started again immediately, and the subject was given another 5 minutes in which to approach or retreat. Testing continued on a subject until it either failed to approach or retreat within 5 minutes on a trial or had completed 10 trials. Subjects which failed on any trial to approach or retreat were all treated in the data as chicks which completed less than 10 trials, contrasted to chicks which did complete 10 trials. All subjects completing less than 10 trials were grouped together since 85% of this group completed no trials, 7% completed 1 trial, and 8% were distributed about evenly over those completing 2 through 9 trials.

One additional measurement was made on those subjects that completed 10 trials; these birds were allowed on the tenth trial to move about freely in the test apparatus as the sound continued for the full 5 minutes. The time they spent in the area halfway or more toward the speaker giving the sound was recorded. A Gellermann's Series of left-right settings (Gellermann, 1933) was used to determine which speaker the sound came from on each of the 10 trials.

One could record, therefore, for each sound the number of subjects (out of an N of 20) that completed 10 trials and the number that completed less than 10 trials. Furthermore, for those subjects completing at least 1 trial, the average latency of response on the first trial could be computed. For subjects completing 10 trials, the average number of approaches out of 10 trials (an analysis of which would also be an analysis of the average number of retreats), the average mean latency of response (trials 2 through 10), and the average time out of 5 minutes spent near the speaker giving the sound on the tenth trial could be computed.

If the number of subjects completing 10 trials were significantly greater for a call than for controls, this call could be said to elicit locomotion. Calls in which fewer subjects completed 10 trials than in controls could be said to inhibit locomotion. If the average latency of response on the first trial to a call were significantly shorter than with controls and other calls, this call is eliciting a strong locomotor response on its first presentation to subjects. A short average mean latency of response (trials 2 through 10) also indicates that the call elicits a strong locomotor response. If the average percentage of approaches out of 10 trials to a call were significantly greater than with the control white noise, this call is an approach eliciting call; if significantly less than with white noise, a call is a retreat eliciting call. If, for a call, significantly more time were spent in the end of the apparatus giving the call on the tenth trial than for controls and other calls, this call elicits strong attraction.

In this way it is possible to classify a call as one which either elicits approach, elicits retreat, reduces locomotion, or has no significant effect on locomotor behavior.

The vocalizations of subjects were noted both while they were at the starting location before the test sound was played on the first trial and during testing of their responses to sounds. Subjects could be classified separately before and during testing as silent, giving primarily content calls, giving primarily flock calls, or giving a significant number of both content and flock calls. A subject's vocal behavior could then be compared to its locomotor behavior in response to a test sound, revealing any connection between the calls of a chick and its motivation to respond to the calls of another pheasant.

RESULTS

Conditions During Testing

A number of factors were examined to see if they affected the responses of subjects to test sounds (Appendices A and B contain the statistical results).

The time of day and test-apparatus temperature did not significantly affect the responses of subjects to test sounds. The locomotor abilities of the subjects and their age within 0 to 30 hours after hatching also did not affect their behavior. Game-farm chicks did not significantly differ from wild chicks in their locomotor behavior. Chicks showed no preference for one speaker over the other.

Locomotor Responses To Test Sounds

Number Of Subjects Completing 10 Trials

No sound and white noise did not elicit significantly different percentages of subjects completing 10 trials, so these controls were combined and compared to each pheasant call (Table 1). The alarm and squeak calls produced significantly smaller percentages of subjects completing 10 trials than did controls. The brood-gathering and content calls produced significantly greater percentages than did controls, and the hiss, brood-caution, fright, and flock calls produced no significant differences in percentages of subjects completing 10 trials than did controls.

Table 1. Chi square contrasts of the number of subjects completing ten trials and the number of subjects completing less than ten trials in response to controls and pheasant calls.

Test Sound	Number of subjects completing: 10 trials	Number of subjects completing: <10 trials	Probability of X^2 exceeding computed value
No Sound	5	15	0.705
White Noise	4	16	
Combined Controls (No sound and white noise)	9	31	
Brood Gathering	12	8	0.004*
Content	11	9	0.012
Alarm	0	20	0.021
Squeak	0	20	0.021
Hiss	3	17	0.494
Brood Caution	3	17	0.494
Fright	2	18	0.238
Flock	3	17	0.494

*Probabilities opposite each pheasant call are from X^2 contrasts of the call versus combined controls.

Number Of Approaches In 10 Trials

Subjects tested on the control no sound were excluded from this analysis since approach or retreat could not be recorded for them. Subjects tested on the brood-gathering call and brood-caution call approached significantly more than subjects tested on white noise (Tables 2 and 3). No other significant differences appeared.

Latency Of Response On First Trial

Fright-call subjects had significantly shorter latencies of response on the first trial than did brood-gathering, flock, alarm, and white-noise subjects (Tables 4 and 5). Content-call subjects had significantly shorter latencies than did alarm-call and white-noise subjects, and hiss-call subjects had significantly shorter latencies than did white-noise subjects.

Mean Latency Of Response (Trials 2-10)

Subjects played any call, except the flock call, had significantly shorter mean latencies than did subjects in either control (Tables 6 and 7).

Time Spent In End Giving The Sound On Tenth Trial

Subjects played the brood-gathering and brood-caution calls spent significantly more time in the end of the apparatus giving the call on the tenth trial than did subjects played any other sound, except the flock call (Tables 8 and 9). Flock and content-call subjects spent significantly more time than did hiss-call and white-noise subjects.

Table 2. Results of the analysis of variance on differences in the number of approaches in ten trials in response to white noise and pheasant calls.

Source of variance	Degrees of freedom	Sum of squares	Mean square	F	Significance probability of F statistic
Among	6	104.270	17.378	2.992	0.020
Within	31	180.045	5.807		
Total	37	284.315			

Table 3. The number of approaches in ten trials in response to white noise and pheasant calls.

Test Sound	Number of subjects	Average number of approaches in ten trials
White Noise [a*]	4	4.75
Fright[ab]	2	5.50
Flock[ab]	3	6.33
Hiss[ab]	3	6.66
Content[ab]	11	7.63
Brood Gathering[b]	12	9.41
Brood Caution[b]	3	10.00

*Sounds which do not have at least one superscript letter in common were found significantly different at $\alpha = 0.05$ by a Duncan's New Multiple Range Test.

Table 4. Results of the analysis of variance on differences in latency of response on the first trial to controls and pheasant calls.

Source of variance	Degrees of freedom	Sum of squares	Mean square	F	Significance probability of F statistic
Among	9	170316.689	18924.076	2.627	0.013
Within	56	403377.795	7203.174		
Total	65	573694.484			

Table 5. The latency of response on the first trial to controls and pheasant calls.

Test Sound	Number of subjects	Average latency of response on first trial (seconds)
Fright[a]*	5	24.000
Squeak[abcd]	2	73.000
Content[ab]	12	77.416
Hiss[abc]	5	101.600
Brood Gathering[bcd]	15	130.666
Brood Caution[abcd]	4	132.250
No Sound[abcd]	7	134.428
Flock[bcd]	7	150.428
Alarm[cd]	3	213.666
White Noise[d]	6	220.500

*Sounds which do not have at least one superscript letter in common were found significantly different at $\alpha = 0.05$ by a Duncan's New Multiple Range Test.

Table 6. Results of the analysis of variance on differences in mean latency of response (trials 2 through 10) to controls and pheasant calls.

Source of variance	Degrees of freedom	Sum of squares	Mean square	F	Significance probability of F statistic
Among	7	17670.058	2524.294	4.849	0.001
Within	35	18219.806	520.565		
Total	42	35889.865			

Table 7. The mean latency of response (trials 2 through 10) to controls and pheasant calls.

Test Sound	Number of subjects	Average mean latency of response (seconds)
Fright[a*]	2	9.777
Brood Gathering[a]	12	17.750
Brood Caution[a]	3	22.555
Hiss[a]	3	26.000
Content[a]	11	36.404
Flock[ab]	3	46.111
No Sound[b]	5	67.800
White Noise[b]	4	75.027

*Sounds which do not have at least one superscript letter in common were found significantly different at $\alpha = 0.05$ by a Duncan's New Multiple Range Test.

Table 8. Results of the analysis of variance on differences in the time spent in the end of the apparatus giving the sound on the tenth trial.

Source of variance	Degrees of freedom	Sum of squares	Mean square	F	Significance probability of F statistic
Among	7	206839.349	29548.478	6.382	0.0005
Within	32	148153.750	4629.804		
Total	39	354993.100			

Table 9. The time spent in the end of the apparatus giving the sound on the tenth trial.

Test Sound	Number of subjects	Average time spent in the end of the apparatus giving the sound (seconds)
White Noise[a]*	4	64.750
Hiss[a]	3	71.666
Fright[ab]	2	88.000
No Sound[ab]	2	126.000#
Content[b]	11	170.000
Flock[bc]	3	200.666
Brood Gathering[c]	12	249.500
Brood Caution[c]	3	288.666

*Sounds which do not have at least one superscript letter in common were found significantly different at $\alpha = 0.05$ by a Duncan's New Multiple Range Test.

#Computed from the time spent in the end the bird first entered or, if the bird spent time in both ends, from an average of the times spent in both ends.

Vocalizations Of Subjects Related To Their Locomotion

Vocalizations Before Testing

Subjects giving flock calls before being tested were significantly more likely to complete 10 trials during testing than were silent subjects, whereas content-calling subjects were no more likely to complete 10 trials than were silent subjects (Table 10).

Vocalizations During Testing

Subjects which were in any way vocal (content calls, flock calls, or a combination of both calls) during testing were more likely to complete 10 trials than were silent subjects (Table 11).

Table 10. Chi square contrasts of the number of subjects completing ten trials and the number of subjects completing less than ten trials among subjects vocalizing or silent before being tested.

Type of vocalization given before testing	Number of subjects completing 10 trials	Number of subjects completing $<$10 trials	Prob. of X^2 exceeding computed value
Content calls	4	16	
			$.70 > P > .50$
Silent	14	72	
			$< .001$
Flock calls	32	47	

Table 11. Chi square contrasts of the number of subjects completing ten trials and the number of subjects completing less than ten trials among subjects vocalizing or silent during testing.

Type of vocalization given during testing	Number of subjects completing 10 trials	Number of subjects completing $<$10 trials	Prob. of X^2 exceeding computed value
Silent	0	95	
			$< .001$
Content calls	9	12	
			$< .001$
Flock calls	16	13	
			$< .001$
Content & Flock calls	4	11	

DISCUSSION

Controls

No Sound

Subjects tested in a silent test apparatus did move about some. This degree of exploratory behavior could then be compared to the movement or lack of movement elicited by white noise and the pheasant calls.

White Noise

This sound did not increase or decrease the number of subjects exhibiting exploratory behavior compared to no sound. Departure from the base line locomotor behavior of both controls could then be attributed to some specific effect of the pheasant calls on the subjects and not simply to an effect any sound might have on movement.

Calls Eliciting Approach

Brood Gathering

This is probably the most important call to the survival of young pheasant chicks. Evidence that it elicits fast approach and maintains the interest of chicks is seen in the high percentage of subjects that completed 10 trials, the high number of approaches out of 10 trials, the short latencies of response, and the great amount of time spent near the call on the tenth trial.

The hen gives this call as she returns to the area where she was frightened from her brood. Since chicks often scatter over a large area when surprised by danger, the function of the brood-gathering call seems to be one of attracting the young back to the hen from their hiding places. In the dense vegetation where the hen has to rejoin her scattered young, it is difficult to see how she would accomplish this without an attraction call to the young.

In the wild if a chick failed to approach the hen's brood-gathering call, it might fail to rejoin the hen. This would be fatal to a chick. Natural selection toward the development of a gathering call and a strong approach response of chicks to it would be strong. Some subjects, however, did not approach the brood-gathering call in the test situation. This does not mean, though, that they would not have responded in the wild since the laboratory study set arbitrarily the time in which a subject had to respond to be credited with an approach. In the wild the hen could also approach the chick, thereby rejoining it. The results of this study nevertheless indicate a variation in the strength of approach response to the brood-gathering call.

Response to the brood-gathering call, and all other adult calls, was innate since subjects never heard adult pheasant calls before testing. There is a possibility, as Gottlieb (1966) pointed out for domestic fowl, that chicks may respond to the hen's calls because they structurally resemble the chick's own neonatal calls.

The decrease in average latency of response from the first trial to the mean of trials 2 through 10 (Figures 5 and 7) on the brood-gathering call, and other sounds, indicates that there is a shortening of response time after a small number of exposures. Latencies of response, in fact, usually level off after about 7 trials. This suggests that in the wild a few calls by the hen to her chicks while they are still around the nest would be sufficient to establish a rapid response which would be valuable after the hen and brood have left the nest area.

Content

Next to the brood-gathering call, the content call of the chick elicits the strongest approach response. In the wild if a chick approached this call, it would bring the chick to other young. However, it is likely that a content-calling chick would be with the hen. Therefore approach to this call could also result in reunion with the hen. Because this call is not loudly given, and is therefore not suited for attraction at great distances, it may be more important as a short-range contact note to other chicks and to the hen.

Subjects heard their own and other chick's content calls before being tested, thus imprinting to this call could have been responsible for their approach to it during testing. Auditory isolation from other chicks and embryonic de-vocalization (to eliminate or reduce self-stimulation) with the collodion technique (Gottlieb and Vandenbergh, 1968) could be used to determine if approach to the content call is innate.

Calls Inhibiting Locomotion

Alarm

The alarm call of the adult male pheasant strongly inhibits the locomotion and vocalizations of chicks; no subjects completed 10 trials. Inhibition of locomotion (usually in the form of crouching), rather than retreat, was the most pronounced response to the alarm call. Crouching in response to this call was similar to the "fear" response of the domestic chick (*Gallus gallus*) which Kilham, Klopfer, and Oelke (1968) described as a closing of the eyes, bobbing of the head, and often a dropping of the beak to the floor.

Crouching in response to the male's alarm call in the wild would be of survival value to chicks since their protectively colored plumage blends into the vegetation around them. Although the male does not normally take part in raising the chicks, he inhabits the same cover as do the hen and her brood, and his loud warning call is apparently important in alerting the young to danger. Adult male and female red grouse (*Lagopus lagopus scoticus*) give a warning "kok" which causes the young to crouch immediately (Watson and Jenkins, 1964).

Squeak

The hen's squeak call also inhibits locomotion and vocalizations in chicks. I have heard this call from captive hens when they were approached and from a hen in the wild as she called after I had positioned myself between her and her chicks. I have also often heard hens give a series of squeaks in flight when frightened from their chicks in the field. Silent crouching to this call would have the same survival value to chicks as this response to the male's alarm call has.

Holcomb (1964) observed chicks quietly crouching in response to a hen pheasant's "squawking" call in the wild. Warning calls are therefore stimuli which elicit concealment reactions from pheasant chicks.

Calls Not Greatly Affecting Locomotor Behavior

Hiss

This call produces neither significant approach nor inhibition of locomotion. The hiss is a short-range call given by adults and young of both sexes when they are intimidated by a human or other animal. It is unlikely that pheasant chicks in the wild depend on this call as an auditory stimulus affecting their locomotor behavior. Collias (1952) found chicks of domestic fowl also indifferent (no approach or avoidance) to hissing sounds.

Brood Caution

It is difficult to assess the value of the brood-caution call to chicks because it elicited a strong approach response, but only from 3 subjects out of 20. Birds that completed 10 trials behaved much like chicks that completed 10 trials to the brood-gathering call. This call is given by the hen at times of danger; if chicks moved toward the hen at such times it would probably be of more advantage than movement in some other direction.

Fright

The fright call of the chick elicits neither significant attraction nor inhibition of locomotion. Since this call is a modified flock call and is given under situations of stress which sometimes elicit flock calls, many of the statements made about the flock call may also apply to the fright call.

Flock

Like the fright call, the flock call of the chick does not significantly affect the locomotion of chicks. Chicks apparently hear both calls since their hearing range is from about 100 to 12,000 cycles per second (Dowling, 1952: 24). The flock call is given by a cold, hungry, or isolated chick; this may explain why it elicits no definite approach. Collias and Collias (1956) pointed out for canvasback (*Aythya valisineria*) and redhead (*Aythya americana*) ducklings that a lost bird would be less likely to approach another lost bird than a group of young birds that would more likely be content calling. The function of the flock call is explored in the next section.

Vocalizations Of Chicks Related To Their Locomotion

The vocalizations of subjects were found to be related to their locomotor responses to test sounds. Since subjects that flock called before being tested were more likely to locomote in response to tape-recorded calls than were silent or content-calling subjects, the flock call apparently indicates that a chick is motivated to give a locomotor response to a call. Collias (1952) stated that distress calling in domestic chicks seemed to indicate a lowering of the threshold of social responsiveness.

The flock call appears to be a care-soliciting call to the hen. Holcomb (1964) reported the repeated rush of a hen pheasant at him whenever one of her chicks that he was holding cheeped loudly; I have observed this in penned pheasants. Parent red-legged partridge (Alectoris rufa) (Goodwin, 1953) and red grouse (Watson and Jenkins, 1964) also approach lost cheeping chicks. In all four of the above gallinaceous species the cheeping of a lost chick also stimulated parental calling to chicks. Tinbergen's (1951) description of Bruckner's experiment in which domestic hens ignored plainly visible but inaudible chicks (they were covered by a bell jar) but approached concealed cheeping chicks further supports the idea that distress calling in young galliforms is an important care-soliciting stimulus to parents.

Although subjects that gave any type of call during testing were more likely to complete 10 trials than were silent chicks, flock calls were usually given before the tape-recorded call was played, whereas approaching chicks sometimes gave content calls or a combination of content and flock calls. After a subject reached the end giving the call, the bird generally either became silent or gave content calls. Bermant (1963) found that domestic chicks decreased loud distress calls when the hen's calls were played to them, and Collias (1952) found in the same species that the clucking of a broody hen also elicited approach and pleasure notes.

The flock call has survival value in the wild because it elicits approach and brood-gathering calls from the hen; the hen's calls then not only attract the young but silence them as they approach.

SUMMARY

The locomotor responses of pheasant chicks to conspecific calls and the vocalizations of the chicks relating to their locomotor responses were measured in a test apparatus permitting approach or retreat movements. The results of these tests follow.

1. Locomotor responses were not significantly affected by time of day, test-apparatus temperature, walking ability of the subject, age of the subject within 0 to 30 hours, source of the birds (game farm or wild), or speaker used to play the call.
2. The brood-gathering call and the content call elicited strong approach from chicks.
3. The alarm call and the squeak call inhibited locomotion in chicks.
4. The hiss call, brood-caution call, fright call, and flock call did not greatly affect the locomotion of subjects.
5. The flock call is primarily a care-soliciting call.
6. Conspecific calls appear to be important to the survival of young pheasant chicks in the wild.

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APPENDIX A

Conditions under which chicks were tested.

Condition		Number of subjects completing 10 trials	Number of subjects completing <10 trials	Prob. of X^2 exceeding computed value
Time when tested	12 PM- 6 AM	7	32	
	6 AM- 12 AM	10	43	0.118
	12 AM- 6 PM	20	40	
	6 PM- 12 PM	24	49	
Temperature of test apparatus	≥ 29°C	23	94	0.091
	< 29°C	26	61	
Age when tested on brood gathering call	0-10 hrs	5	5	0.602
	10-20 hrs	12	8	1.000
	20-30 hrs	12	8	
Source of chicks tested on brood gathering call	Wild	6	9	0.241
	Game farm	12	8	
Walking ability	Good	51	141	0.911
	Fair	5	13	
		Number of approaches	Number of retreats	
Speaker used	Left	254	81	0.089
	Right	284	66	

APPENDIX B

Responses of four groups of chicks to the brood-gathering call.

Type of response measured	Group of chicks: Game farm (age in hrs) 0-10	10-20	20-30	Wild	ANOVA Probability
Average latency of response on first trial (seconds)	141.20	130.66	87.21	122.33	0.448
Average mean latency of response for trials 2-10 (seconds)	24.15	17.75	25.40	10.85	0.237
					Kruskall-Wallis* Probability
Average number of approaches in ten trials	8.80	9.41	7.50	10.00	0.20>P>0.10
Average time spent in the calling end (seconds)	234.40	249.50	209.83	273.166	P>0.99

*Analysis of variance was not run since variances were not homogeneous.