tonal drawing of the fossil. Marion A. Jenkinson improved upon our manuscript and provided varied additional assistance.

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Responsiveness of young Herring Gulls to adult "mew" calls.—Responsiveness of young, parentally naive nidifugous birds to parental calls has received emphasis recently in studies of species identification by voice (Gottlieb 1971, 1973). In general it has been found that parentally naive young tend to approach preferentially to the parental calls of their own species. Although tests conducted with parentally naive young are of considerable ontogenetic interest, it is important to note that they do not necessarily reflect the response tendencies of young reared under more natural conditions: in many species, including gulls, adults commonly vocalize over the young before the latter hatch (e.g. Evans 1970a, Impekoven and Gold 1973, Hess 1973). It is therefore of considerable biological significance that moderate amounts of auditory stimulation of late embryos or newly hatched young have been found to facilitate post-hatch responsiveness to species—typical parental calls (Gottlieb 1965, 1966). In the Laughing Gull (*Larus atricilla*), stimulation of embryos with adult "crooning" (= "mew") calls for periods of up to about 1 h per day has similarly been shown to enhance embryonic and post-hatch responsiveness to parental calls of that species (Impekoven and Gold 1973).

Young Herring Gulls (*L. argentatus*) appear to differ from the more commonly studied precocial species (cf. Gottlieb 1971) in that parentally naive young approach and vocalize more to the parental mew call of a closely related, sympatric

species, the Ring-billed Gull (*L. delawarensis*) than to the mew call of their own species (Evans 1973). Beer (cited in Impekoven and Gold 1973) has also noted that parentally naive young Laughing Gulls do not approach the crooning call of their own species. When Herring Gulls are given embryonic exposure (maximum of 1 h per day) to a Herring Gull mew call, the typical enhancement of post-hatch responsiveness occurs, but this effect is not sufficient to reverse the preference for calls of the other species (Evans 1973).

Because of the unexpected direction of the species preference exhibited even by embryonically stimulated Herring Gulls, it is important to determine whether the earlier (Evans 1973) results with this species were merely associated with the specific test situation involving calls of the Ring-billed Gulls, or whether the results have more generality. The present study was therefore designed to extend the earlier results by testing an additional group of embryonically stimulated Herring Gull young with the mew calls of their own species and the functionally equivalent call of the allopatric Black-billed Gull (*L. bulleri*). Ring-billed Gull mew calls were also included in the tests to assess the repeatability of the previous findings for calls of that species.

The Black-billed Gull breeds in inland New Zealand, in dense colonies on gravel beds along rivers (Beer 1965). The young are relatively precocial and often leave the nest soon after hatching (Beer 1966). During this time, the young respond to parental mew calls that consist of rapid series of short syllables having a purringlike quality. These calls elicit approach responses by the highly mobile young (Evans 1970a).

Test stimuli from the three gull species were recorded within breeding colonies from adults attending active nests. Mew calls used in this study are illustrated elsewhere (Evans 1973, Fig. 1, calls RB, BB, and HG-1). These calls were spliced into otherwise blank continuous loops and played back repeatedly at a rate of approximately 30 per min. Calls were played at an intensity of 65 db (scale B, fast) as measured 25 cm in front of the loud speaker. Tests were conducted in "tip-floor" pens as illustrated in Evans (1972). Each pen contained a central compartment for the test bird, and two end compartments, each with a loud speaker, to provide the auditory stimuli. The floor of the central compartment was free to tip down at either end when walked on by a young gull. Microswitches under the central tip floor controlled the loud speakers, activating the speaker located at the end of the pen farthest from the bird at any given time while leaving the speaker adjacent to the bird inactive. In this way the bird could move to and fro in the pen, at all times approaching the sound stimulus emanating from the far end of the pen. Microswitches connected to an event recorder registered the number of times the bird crossed from one end of the pen to the other. A microphone placed above the pen monitored the vocalizations of the test bird. The microphone was connected to a sound-operated relay, the sensitivity of which was arbitrarily set to be activated by high-intensity vocalizations of the young, but not by the relatively less intense test stimuli.

Herring Gull eggs were collected from an island colony in Manitoba, and incubated in the laboratory, in a darkened, forced air incubator held at 99° ± 1°F. After pipping, eggs were placed in a sound attenuated chamber and exposed to the Herring Gull test call for a 30-min period twice a day until hatching. An identical schedule of exposure of pipped Herring Gull eggs has been found to enhance general post-hatch responsiveness without altering the preferences exhibited (Evans 1973). Twenty-three young hatched (50%), and were reared in groups of three or four, in lighted pens equipped with roughened floors for traction. All

TABLE 1

RESPONSIVENESS OF YOUNG HERRING GULLS TO MEW CALLS OF THREE GULL SPECIES

Response	Stimulus[1]			
	HG	BB	RB	Silence
Approaches (N = 23)				
Mean per period	0.09	0.87	1.22	0.57
No. responding most to stimulus	0	3	6	6
Vocalizations (N = 23)				
Mean per period	9.4	27.5	36.3	21.3
No. responding most to stimulus	0	3	11	8

[1] HG = Herring Gull mew; BB = Black-billed Gull mew; RB = Ring-billed Gull mew.

were hand-fed four times daily with fresh frozen ocean perch fillets supplemented with vitamin enriched fish-flavored cat food. Testing was done on the second day after hatching when the young were sufficiently strong on their feet to locomote in the test apparatus. The three test stimuli were presented successively, for periods of 2½ min each, in balanced order. Additional 2½-min periods of silence were also given to establish base line data.

Test results are shown in Table 1. As expected, young Herring Gulls responded significantly more often to the calls of the Black-billed Gull than to the equivalent call of their own species (Wilcoxon matched pairs signed ranks tests: for vocalizations, $P < 0.01$; for approaches, $P < 0.05$ by 1-tailed test). Vocalizations ($P < 0.01$) and approaches ($P < 0.01$) were also greater to the Ring-billed Gull call than to the Herring Gull call. The latter result confirms the preference by young Herring Gulls for the mew call of the Ring-billed Gull. Although the embryonically stimulated young Herring Gulls were clearly able to discriminate between the test stimuli, they did not respond preferentially to the call of their own species. Impekoven and Gold (1973) have also noted that a large proportion of their embryonically stimulated Laughing Gulls did not approach parental calls during post-hatch tests. These results suggest that additional post-hatch experience, e.g. visual imprinting (Evans 1970b), or learning reinforced by parental feeding (pers. obs.) may be necessary for the normal development of responsiveness to species-typical calls in gulls.

Comparison of the responses to the test stimuli with responses during periods of silence indicates that the Herring Gull mew call had a definite inhibitory effect ($P < 0.01$) on the responsiveness of the young, whereas the calls of the Ring-billed and Black-billed Gulls did not. The Herring Gull mew call thus appears to be adapted to reducing locomotor responsiveness of the young, presumably favoring their localization at or near the nest. By inhibiting early wandering, the Herring Gull mew call would appear to facilitate the early development of the close link with the home territory known to occur in young of this species (Tinbergen 1953).

The marked similarity in call preferences exhibited by young Herring Gulls (Table 1) and Ring-billed Gulls (Evans 1973) suggests that preferential response tendencies by young are relatively conservative traits within closely related species of the Laridae. In contrast, the adult mew calls used as test stimuli exhibit

marked interspecific differences in form and, apparently, in the way in which they control responses of the young. Taken together, these results suggest that adaptive radiation of the parent-young acoustical communication system in this group has been brought about in large part, although not solely, by adaptive variations in the calls of the adults acting relative to the more stable response tendencies of the young.

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Least Tern breeding range extension in Maine.—On 13 August 1972 while watching shorebirds on the beach immediately west of the mouth of the Morse River in Phippsburg, Maine (43° 44′ N, 69° 49′ W), I was harried by a pair of Least Terns (*Sterna albifrons* Pallas) that flew around me to within a meter of my head uttering their alarm notes continually. Their behavior suggested the presence of a nest but I was unable to find one.

On 23 June 1973, I returned to the same place with Michael Heath and Peter Canby. Least Terns dove at us and we counted a minimum of 10 birds. It was impossible to determine a maximum number because fog limited visibility to approximately 50 m. By watching from a short distance as the terns alighted on