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NATURAL AND EXPERIMENTAL ADOPTION OF PIPING PLOVER CHICKS

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Abstract.—Two natural adoptions and one experimental adoption of a conspecific chick by Piping Plovers (*Charadrius melodus*) were observed in Nova Scotia during 1983. These may have occurred because of lack of recognition by both young and adult Piping Plovers. Fostering of chicks appears to be feasible, but is of limited use. Reciprocal fostering of complete clutches of eggs is suggested as a means of enhancing gene flow among demes.

ADOPCIÓN NATURAL Y EXPERIMENTAL DE PICHONES DE *CHARADRIUS MELODUS*

Sinopsis.—En estudios que se llevaron a cabo en Nova Scotia durante el 1983 se observaron dos adopciones naturales y una experimental de polluelos de *Charadrius melodus,* por adultos de la misma especie. Las mismas pueden haber sido el resultado de la falta de reconocimiento tanto por parte de pichones como de adultos de esta ave. La adopción de pichones como medida de manejo es de uso limitado. Se sugiere el intercambio de huevos como medida para aumentar el flujo genético entre poblaciones.

Piping Plovers (*Charadrius melodus*) have recently declined throughout their range, due largely to human disturbance and habitat alteration (Haig and Oring 1985). Stabilization and ultimate recovery of its population will require careful management. To further this goal, I report two natural and one experimental temporary adoptions of a conspecific chick by Piping Plovers in Nova Scotia during 1983. These observations suggest that fostering might be used as a management tool to lessen the effects of inbreeding depression on small fragmented populations.

Natural adoption of a chick from a four-day-old brood of three, by a four-day-old brood of four and their female parent occurred on 12 June at St. Catherines River Beach (43°50′N, 64°50′W). Apparently, the adoption was prompted by a temporary lack of attention by the foster chick's parents. The female parent was away feeding, leaving the male to attend the chicks. However, during the entire event the males of the two broods in question were engaged in a "parallel run" display (in sensu Cairns 1982). Left alone, the chick made a wide circuit around the males and strayed towards the adjacent brood, joining them at 12:34:30 AST. It subsequently fed with the brood and attending female until 12:40:00. Then, all five chicks went to the female to be brooded. The female had to remain standing to cover them all. The adopted chick with two others resumed feeding at 12:42:37. Finally, the adoption ended at 12:43:00 when the chick rejoined its siblings. There was no obvious reason for the chick's return.

This brief adoption may have occurred solely because of the unusual circumstances noted above, but usual behavior may have also facilitated the adoption. During 135 h of brood observation in 1983, I noted chicks straying to adjacent feeding territories on six occasions. Only one of these chicks was briefly chased by the proprietors of the invaded territory. Perhaps, this low level of aggression toward stray chicks enhances the possibility of adoption.

This suggestion is further supported by my observation at Cherry Hill Beach (44°09′N, 64°31′W) on 8 June, when an adult Piping Plover flew into a pair's territory and was approached by, and brooded one of their eight-day-old chicks. Although it was driven away by the chick's parents after brooding for only 10 s, this observation also demonstrates a remarkable tolerance for unrelated chicks and may be indicative of a strong parental drive.

These observations suggest that chick recognition by both young and adult Piping Plovers may be limited. This could occur if there was no ecological requirement for recognition (Evans 1980). Among Piping Plovers, parental investment may be appropriately dispensed without parent-young recognition because two factors prevent brood mixing. First, the species exhibits a low density distribution throughout its range (Haig and Oring 1985). Nova Scotia's distribution is a typical example with most beaches having only one or two breeding pairs (Flemming, unpublished data). Second, adults vigorously defend their territories throughout the breeding season (Cairns 1982), thus separating adjacent broods. Therefore, natural chick adoption is likely to occur only on those few beaches that have high densities and only under unusual circumstances, such as territorial breakdown. This prerequisite existed for all six stray chicks and for both natural adoptions.

If recognition is limited, it follows that fostering of Piping Plover chicks might prove feasible. Such speculation was tested when another series of unusual circumstances arose.

On 23 July, at Round Bay Beach (43°47′N, 65°20′W), a late-hatching chick was abandoned by its parents and three older siblings (ranging from 0.5 to 2 d old). The chick was ignored despite its having hatched at 11:00, an unusual behavior since parents are normally most protective during hatch (Flemming, unpublished data). Five attempts at placing it with its siblings between 12:30 and 13:00 failed when its parents and siblings continued to ignore it. By 13:00, the chick was shivering convulsively, so I decided to foster it with another brood that had hatched on 21 July at Johnstons Pond Beach (43°45′N, 64°57′W).

The chick was held until the next day to improve its condition by warming it in a makeshift brooder. At 10:00 on 24 July, the chick was banded and introduced to the three-chick brood at Johnstons Pond Beach. Initially ignored, the adults were very protective of it by 13:30. Later, at 16:10, the chick was observed being brooded by an adult. In fact brooding continued even as I approached to within 3 m, despite the other chicks having been led away by the other adult. The adult was still brooding the chick at 16:30 when I left.

From the evening of 24 July until early afternoon on 25 July, it rained heavily. Despite extensive searches, the adopted chick was never seen again, and was presumed to have died as a result of its weakened condition, augmented by the heavy rain. Its foster siblings survived the rain and were later seen flying.

Besides the chick's condition, the 2 d age separation between the adopted chick and its surrogate brood may have affected the outcome of the fostering attempt. Since Piping Plover chicks normally hatch synchronously, and are precocial, any age separation can lead to neglect of a younger chick. This is supported by the outcome of three of my study broods, each of which had a chick that hatched a day later than the rest. All three chicks died within 2 d of hatching. Although it was unclear whether they died of poor development, parental neglect, or both, this finding should serve as a warning against the mixing of different aged chicks. Ideally a complete clutch of four eggs should be fostered so that hatch and consequently age are synchronized.

Natural adoption has been recorded for a variety of birds (Pickup 1973; Tufts 1973, p. 85) including the congeneric Ringed Plover (*Charadrius hiaticula,* Pienkowski 1984). Furthermore, fostering has been used in endangered species recovery plans. Notable examples include the Whooping Crane (*Grus americana,* Drewien and Kuyt 1979), and several species of falcons (*Falco* sp., Newton 1979). Perhaps fostering could also be used to assist the Piping Plover's dwindling population.

Wilcox (1959) and Haig and Oring (1985) have shown that adult Piping Plovers demonstrate a high degree of breeding site fidelity. It follows that Piping Plovers may have small geographically isolated demes. If the population continues to decline, genetic exchange among demes is likely to decrease resulting in genetic divergence through genetic drift. Inbreeding depression is a natural consequence of this scenario (Allendorf 1983), and could ultimately limit the species' ability to recover.

A fostering technique may overcome this threat to the Piping Plover's survival. Genetic exchange might be achieved by taking eggs from one deme and exchanging them for eggs from another. Thus, reciprocal fostering could be used to enhance gene flow among demes, making it a valuable management tool.

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