

SHORT COMMUNICATIONS

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ADOPTION OF SPECTACLED EIDER DUCKLINGS BY ARCTIC LOONS

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In July 1974, during a study of waterbirds near Storkersen Point, Alaska (70°25'N, 148°45'W), I observed a brood of five Spectacled Eider (*Somateria fischeri*) ducklings accompanying a mated pair of Arctic Loons (*Gavia arctica*). I present here an analysis of this interspecific adoption as a contribution to our understanding of parent-young interactions. I have found no published reports of similar associations between waterfowl and loons.

A pair of Arctic Loons and a Spectacled Eider nested 10 m apart on a small islet (25 m²) in a 15-ha, 1.5-m deep lake. Both nests were found on 27 June 1974 and had adults in attendance on 6 and 13 July. When next checked on 27 July, the Arctic Loons were accompanied by five Spectacled Eider ducklings. I observed this group for a total of 5.5 h between 27 July and 13 August, after which time I left the study area. I saw no loon chicks or adult female eiders during this period. The islet could not be reached without a boat, but the loon's nest was clearly visible with the aid of a 20× telescope. No eggs were present on 27 July; the fate of the loons' nesting attempt is unknown.

During my observation time, the family spent a total of 4.5 h feeding. It circled the lake, staying close to the zone of emergent vegetation, and the young fed on invertebrates from the surface of the water or plants, or under water. Ducklings stayed within about 2 m of the loon(s) while feeding, and, at intervals of approximately 1 h, went ashore where they preened and rested for up to 25 min. While the ducklings rested, the attendant loon remained concealed within the emergent vegetation (*Arctophila fulva*) less than 20 m from shore.

Arctic Loons normally feed their young with invertebrates from the nest pond (Bergman and Derksen 1977). Spectacled Eider ducklings also eat invertebrates but they are self-sufficient upon hatching. Thus it is noteworthy that on several occasions the loons gave food to the eiders. This was noted only when the ducks were less than 14 days old and occurred from 1 to 6 times/min ($\bar{x} = 2.8/\text{min}$ in 10 one-minute observations), which represents less than 3% of the total feeding time. The loons fed the ducklings less frequently and at a slower rate than loons feed young of their own species (pers. observ.). I attribute this to the eiders' independent feeding activity.

Since Arctic Loon parents regularly feed their young, at least the offering of food should be expected, even when the young are ducklings. Usually a loon located a duckling and then approached to offer the food item, but on a few occasions ducklings waited for a loon to surface from a dive and they then swam toward it to take food. The eiders' acceptance of these offerings suggests that removing

food items from a loon's bill is no different from taking invertebrates from the water surface or from plant stems. Indeed, Kear (1970) reported the innate tendency of many young anseriforms to peck at "small, contrasting, moving objects such as the tips of siblings' and parents' bills."

Parental transport of young occurs in both loons and waterfowl; its significance was discussed by Johnsgard and Kear (1968). I observed this aspect of "parental care" on two occasions when a loon carried a single eider on its back. In both instances, the duckling initiated the activity by climbing up from behind the wing; this agrees with other waterfowl studies. Ducklings preened while being carried, but never nestled beneath the wings. Estimated ages of the eiders were 10 to 14 days.

Potential predators elicit the "karr" vocalization (Höhn 1972) by the adult loon. On four occasions this call was given in response to the presence of Glaucous Gulls (*Larus hyperboreus*) or the observer. Each time the young reacted by clumping tightly and moving toward the loon. When gulls flew over, the loon led the ducklings to emergent vegetation, but when I approached on the land, the family moved to deep water. I once surprised the group in a pond separated from the lake by a 2-m wide ridge; the loon and ducklings fled overland to the lake, with the loon calling constantly.

Those young which respond quickly and correctly to parental alarm calls increase their chances of survival. In this instance, the young responded even though the parent was a different species. Such response to interspecific filial communication may be established through auditory imprinting or discrimination learning (Collias and Collias 1956, Gottlieb 1965). For such learning to occur in the wild, either conspecific parental calls must be absent and calls of both species must be similar in physical characteristics, or the imprinting species must be susceptible to a wide range of auditory signals. Klopfer (1959) stated that ducklings (especially of ground-nesting species) approach most rhythmic, repetitive auditory signals without discrimination. Collias and Collias (1956) showed that ducklings approached signals which were low-pitched, repetitive, and monosyllabic. A combination of these requisites would account for the ducklings' acceptance of the loons as parents. On the other hand, the hatching of the ducklings near the end of the loons' incubation period explains the loons' receptiveness; the similarity in behavior of loon chick and eider duckling reinforced this acceptance.

This interspecific adoption was successful only because ducklings appeared at the stage of the nesting cycle when the loons were hormonally receptive to the stimulus of young. In other circumstances Arctic Loons may be predators of waterfowl young (Lensing 1967).

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INCUBATION BEHAVIOR OF THE DEAD SEA SPARROW

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The importance of precise regulation of egg temperature during incubation was demonstrated by Lundy (1969) in studies of the domestic fowl, in which no embryo survived continuous incubation above 40.5°C or below 35°C. Similar results were reported for pheasant, duck, quail and domestic fowl by Romanoff and Romanoff (1972). A nest temperature of 34.0°C ± 2.3°C (mean ± SD) was reported by Huggins (1941) for 37 bird species representing 11 orders, which suggests that most birds have similar thermal requirements for successful incubation. The optimal nest temperature is primarily achieved by the incubation behavior of the parents, and according to White and Kinney (1974), the nest attentiveness of some birds is a rectangular hyperbolic function of ambient temperature, where the horizontal asymptote crosses the ordinate at maximal attentiveness time (min/h) in the nest, and the vertical asymptote intersects the air temperature abscissa roughly at optimum incubation temperature. However, they mentioned only briefly the behavioral responses when ambient temperature exceeds optimal incubation temperatures, although heating above optimal temperature may be much more critical for embryonic survival than a similar exposure to cold (Romanoff et al. 1938, Drent 1976).

The aim of this paper is to report how the Dead Sea Sparrow (*Passer moabiticus*) regulates the temperature of its eggs over a range of ambient temperatures.

MATERIALS AND METHODS

The Dead Sea Sparrow, a small passerine of about 14 g, breeds along the Rift Valley in Israel, where air

temperatures (T_a) during the incubation period (April-August) can exceed 45°C at noon, and relative humidity (RH) may fall to less than 10% (Rosnan 1956, Mendelsohn 1974). Their large, covered nest is generally built on dead branches of tamarisk trees, and its exterior is totally exposed to solar radiation. Occupied nests are always within 100 m of fresh water. The nest is a massive oval structure of twigs (25 × 35 cm), weighing up to 1 kg. An S-shaped tunnel leads from the top of the nest to an incubation chamber lined with soft materials in its lower part. Hence the eggs are largely insulated from direct sunlight while the nest is still well ventilated. The eggs are incubated almost exclusively by the female. During the day she leaves the nest for short periods about six times per hour. When ambient temperatures are high ($T_a > 39^\circ\text{C}$), females sometimes stand at the nest opening and pant.

Egg temperatures were recorded by using fresh or dummy gypsum eggs in which a thermistor was inserted. Preliminary observations indicated no differences in temperatures of the real and dummy eggs, and the female incubated the experimental egg normally. We recorded egg temperatures (T_i) in four occupied nests and six abandoned nests in the Jordan Valley, 25 km S of the Sea of Galilee; in two occupied nests in Ein Yahav, 40 km S of the Dead Sea; and in one occupied nest at the Tel Aviv University Wildlife Research Centre (WRC). At the same time we watched and recorded indirectly (from egg temperature records) the sessions and recesses of the incubating females. Daily water losses of the eggs in the nests and eggshell water conductances were also measured, using the method suggested by Ar et al. (1974).

RESULTS AND DISCUSSION

Mean daily temperature of incubated eggs (4 nests, 24 observations) was 33.7°C ± 0.5°C (SD). This temperature is well within the range reported for other passerines (Huggins 1941, Drent 1976). Relative humidity was calculated as follows: mean daily