

ON THE HATCHING INTERVAL OF WHITE PELICAN EGGS

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The hatching interval between eggs in white pelican (*Pelecanus erythrorhynchos*) clutches was determined for 50 2-egg nests in Utah. Eggs hatched 0-23 hours ($n = 4$), 24-47 hours ($n = 13$), 48-71 hours ($n = 15$), or 72-95 hours ($n = 10$) apart. Only 1 of the 2 eggs hatched in the 8 remaining nests. As the interval of hatching increased, the probability of both chicks surviving declined.

INTRODUCTION

The white pelican (*Pelecanus erythrorhynchos*) is a determinant layer, producing a clutch of 2 eggs (1). The eggs within the clutch hatch asynchronously, so that the first chick to hatch has a physical advantage over its sibling. The larger chick often kills the small chick, or forces it from the nest. Such chick mortalities are believed to be the major source of reproductive loss for the species (1, 2, 3).

Asynchronous hatching of eggs has been proposed as a mechanism enabling many avian species to adjust brood size to interseasonal variations in unpredictable food supplies (4, 5, 6). Parent birds feed larger nestlings before smaller chicks and in seasons of scarce food the smaller chick dies without nutritional cost to its sibling. This theory may apply to the asynchronous hatch of white pelicans, but the hatching intervals of eggs in a clutch has neither been quantified nor interpreted relative to chick survival.

METHODS

I recorded hatching information on white pelican eggs from 3 May through 11 June 1973, on Gunnison Island, Great Salt Lake, Utah. Gunnison Island is a traditional nesting site for pelicans (7, 8). A description of the island can be found in Behle (2).

I observed 50 nests daily to determine the hatching interval between eggs. I made all observations using a 20X spotting scope from vantage points overlooking nests, and avoided activities that might disturb incubating or brooding birds. I surveyed nests for eggs and chicks when the adult pelicans adjusted their positions on nests, and during nest-reliefs. Following hatching, nests were surveyed weekly through the nestling period (about 4 weeks) to monitor chick survival. Information from chicks banded with colored, plastic leg bands indicated that 98% of the chicks surviving the nestling period subsequently fledged about 8 weeks later (1).

RESULTS

Both eggs hatched in 42 of the 50 study nests. The 2 eggs hatched during the same 23-hr interval in 4 nests, 24-47 hr apart in 13 nests, 48-71 hr apart in 15 nests, and 72-95 hr apart in 10 nests. Only 1 egg hatched in each of the remaining 8 nests. Examination showed that 5 were addled and 3 contained fully developed embryos.

In 29 of the 42 nests where both eggs hatched, one of the chicks died during the nestling period. Seven apparently died of starvation and their carcasses, at least initially, remained within the nest cup.

Twenty-two chicks died after they were ejected from the nest by a sibling, and subsequently were tossed (while still alive) from the colony by adult birds. To avoid being bitten by its larger nestmate, the smaller chick often moved over the rim of the nest mound. Once the chick was outside the nest cup, the adult grasped it and flipped it from the vicinity. If the chick landed elsewhere in the colony, another pelican tossed it. The chick eventually landed outside the colony and died from exposure. Since adults appear incapable of recognizing their chicks early in the nestling period (9), rejection of all chicks beyond the nest rim probably prevented adoptions of a neighbor's chick.

Both chicks fledged in 13 (26%) of the 50 nests. The incidence of both chicks surviving declined with an increase in the interval between hatching of the eggs (Fig.

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1). Twenty-six (41%) of the 63 chicks fledged were raised in nests from which 2 chicks fledged.

DISCUSSION

The smaller chicks in nests die from either physical abuse by the larger chick or, apparently, starvation. Johnson and Sloan (3) reported that 3.9% ($n = 102$) of the smaller chicks survived to 2 weeks of age. The substantially higher survival of smaller chicks reported here may reflect regional differences between my study area (Utah) and theirs (North Dakota) or seasons (1973 vs. 1974). Also, since eggs hatching later in the season have significantly lower survival at a site (1) differential intraseasonal timing of the two studies may make the survival data incomparable.

Three eggs failed to hatch even though the embryos appeared fully developed. Those eggs might have hatched on the fourth or fifth day after the first egg, but incubation was disrupted by the activities of the hatched chick. Including the 3 developed embryos, hatching chronology within clutches of white pelicans assumed a normal distribution around the interval of egg laying (48 h). Eggs in 41 (82%) clutches hatched in ± 24 h.

In some species with 2-egg clutches, having 2 eggs enables birds to continue the reproductive cycle in event an egg is displaced from the nest or is infertile. The younger nestling rarely survives in nests where both eggs hatch, and the second egg is "insurance" against loss of the first (10, 11, 12). Indeed, Blue-faced Boobies (*Sula dactylatra*) rarely, if ever, raise two chicks although 22% of all chicks fledged in one population hatched from the second egg laid (13). In White Pelicans, however, the second egg to hatch contributed additively to production from the first.

As already noted, the incidence of both chicks surviving declined with an increase in the interval between hatching of the eggs. Greater synchrony of hatching likely decreased physical and behavioral differences between chicks, and increased the probability that adults would (could) raise them both.

Despite greater survival from more synchronous clutches, asynchronous hatching of eggs did not appear to be a mechanism for adjusting brood size to the availability of food in the environment. Most pelican chicks (1, 3), like nestlings of many other species (10, 14, 15), die soon after hatching even though food requirements for maintaining the brood are then relatively low.

Alternatively, the tendency for a pelican to produce a clutch of eggs that hatches synchronously may increase with successive breeding attempts. For many species in which reproductive maturation requires more than a year, older birds are more successful at raising chicks than younger individuals (16, 17, 18). This relationship was recently documented for the brown pelican (*P. occidentalis*) (19). Presumably, reproductive success of white pelicans also improves with age of the parents (1), and greater synchrony of hatching is either a subtle indicator of this experience or a mechanism for adjusting brood size to maximize productivity of both experienced and inexperienced breeders.

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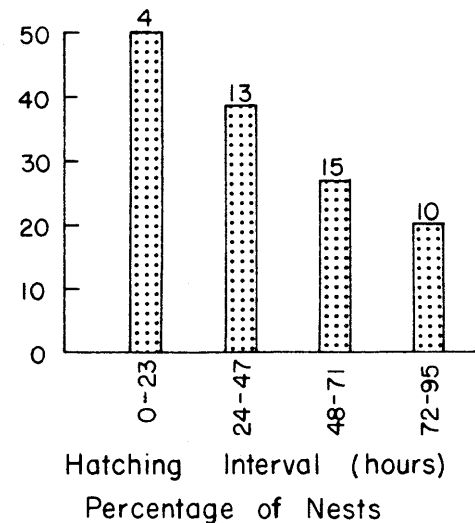


FIGURE 1. Percentage of white pelican nests from which 2 chicks fledged relative to interval between hatching of the eggs. The numeral above each bar is the number of clutches hatching during that time interval.

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