

ERYTHRISTIC EGGS IN THE COMMON TERN

HELEN HAYS

*American Museum of Natural History
Central Park West at 79th St.
New York, New York 10024 USA*

KENNETH C. PARKES

*Carnegie Museum of Natural History
4400 Forbes Ave.
Pittsburgh, Pennsylvania 15213 USA*

Abstract.—Erythrism, an abnormally reddish color, is known in the eggs of a few Laridae and Stercorariidae. It apparently results from the absence of one of the normal pigments and possibly an overdose of another. Erythrism in eggs of the Common Tern (*Sterna hirundo*) is exceedingly rare. Data from the long-term study of the large tern colony on Great Gull Island, New York, provide accurate information about relative frequency of the phenomenon and demonstrate its continuity in two females with changing mates.

ERITRISMO EN HUEVOS DE *STERNA HIRUNDO*

Sinopsis.—Se ha informado eritrisismo (coloración rojiza anormal) en los huevos de algunas especies de Laridae y Stercorariidae. Esta condición parece ser el resultado de la ausencia de uno de los pigmentos normales y la sobreproducción de otro. El eritrisismo es sumamente raro en huevos de *Sterna hirundo*. Datos tomados de un estudio a largo alcance en una colonia de estas gaviotas en Great Gull Island, New York, ha provisto de información precisa sobre la frecuencia de este fenómeno y ha demostrado la continuidad del mismo en dos hembras que cambiaron de pareja.

Erythristic eggs are known in one species of jaeger (*Stercorarius parasiticus*), several species of gulls (*Larus*), and two species of terns (*Sterna*) (Bates et al. 1976, Jourdain and Borrer 1914, Sutherland 1980). Bates et al. explain the phenomenon as follows: "No more than two kinds of pigment are present in the eggshells of most birds . . . , and often one alone or practically none. One of these pigments is blue or greenish and when present occurs throughout the shell structure. The other is brownish, ranging from red to black, and when present is usually near the surface. A small amount makes a white shell yellowish or pale brown and a blue shell green or olive. The brownish pigment also produces any markings that are present which may occur at various depths as the shell is formed, varying in shade according to their depth and the shell colour . . . erythrism may be defined as having the reddish colour exaggerated or abnormally replacing the bluish pigment." At least one early writer erroneously attributed the reddish color of such eggs to their being "stained . . . with blood-pigment" (Borrer 1913).

Erythristic larid eggs are rare in museum collections. Given the assiduousness of egg collectors in the past, the records that exist, as reviewed by Jourdain and Borrer (1914) and Bates et al. (1976), probably give at least an approximation of the frequency of occurrence of this color abnormality in this family. Published records of erythristic eggs of larids

are based on isolated sets collected at widely scattered localities as well as, in a few instances, collections made over a period of years in areas at which red eggs were found on a regular basis. For example, in the last century and the early part of this century, erythristic eggs of five larids were collected at or near two localities along the northern coast of Norway (Bates et al. 1976, Jourdain and Borrer 1914). These included a number of sets of erythristic gull eggs, most of which were those of Herring Gull (*Larus argentatus*), but also some of Great Black-backed Gull (*L. marinus*).

At one locality in England, red eggs of Common Tern (*Sterna hirundo*) were found every season for five or six years. Borrer (1913) believed that "a strain of birds had established itself in this colony whose tendency it was to lay" red eggs, as he did not believe that the same pair of birds could have survived and returned for five or six years to the same spot, but he was obviously unaware of the great longevity of Common Terns. Bates et al. (1976), noting several instances in which sets of red eggs of a particular species were found in successive years at the same site, suggested that the same females might be responsible for these successive clutches.

There are fewer records of erythristic eggs for terns than for gulls. Jourdain and Borrer (1914) and Bates et al. (1976) reported a few records of erythristic sets of eggs for Common and Arctic (*S. paradisaea*) terns in Britain and Europe. A mail survey of the institutions listed by Banks et al. (1973) as having the largest egg collections in North America yielded only two erythristic sets of Common Tern eggs from Great Britain and one from North America. The latter, now in the San Bernardino County Museum, California, was collected on 13 Jun. 1919 at North Nauset Beach, Chatham, Massachusetts. As abnormally pigmented eggs would undoubtedly have been selectively taken by collectors, as suggested by the series of gull eggs from the two Norwegian localities, the paucity of erythristic Common Tern sets in collections may be taken as an indication of their rarity.

Since 1966, the tern colony on Great Gull Island, Long Island Sound, New York (41°12'N, 72°07'W), has been intensively studied (Cooper et al. 1970, DiCostanzo 1980). During the breeding season, a team of field assistants makes a daily search of the 6.9 ha island, marking new nests and individual eggs, and banding chicks on the day of hatching. A few well concealed nests may be missed on these daily checks, but the number of these, we feel, is not significant. The number of nests (including renests) marked per year has risen from about 3000 in 1969–1982 to about 6000 in 1984–1988 and 7000–9000 in 1989–1991. The thoroughness of this survey permits accurate estimates of the frequency of occurrence of any variants, such as unusual egg pigmentation.

The eggs of the Common Tern are highly variable in color. The ground color ranges from off-white through various shades of buff, gray, and tan to a rich olive-brown, blotched with black, gray and brown. Albino eggs are known (example, Carnegie Museum of Natural History set E-6423, two normal and one albino egg from Starve Island, Lake Erie, Ontario,

26 Jun. 1916). Unmarked pale blue eggs are of regular occurrence on Great Gull Island, usually one or two per year. As in the case of the albino egg mentioned above, the pale blue eggs are usually part of an otherwise normal clutch. One female, however, is known to have laid nothing but clutches of blue eggs for four or five successive years even though she changed mates. This suggests that the female determines the color and pattern of the eggs. Bates et al. (1976) noted that females tend to be consistent in the color and pattern of their eggs throughout their lives, and suggested a genetic basis for abnormal color in eggs. Our observations of successive clutches of blue eggs laid by one female are consistent with this hypothesis.

On 4 Jul. 1975, Parkes found a Common Tern nest on Great Gull Island containing one erythristic egg. The next day the nest contained a second egg, also erythristic. The eggs were laid in a scrape in weathered concrete, with no vegetation or other lining. The parents, which were never individually identified, eventually deserted this nest; the eggs were collected on 20 Jul. and taken to the American Museum of Natural History, where they were prepared by Henry Pelzl and catalogued as set 17917. These eggs are somewhat reminiscent of falcon eggs in appearance. The background is between colors 5 (Flesh Color) and 6 (Salmon Color) of Smithe (1975), but paler, and the spots match color 132A (Brick Red) of Smithe (1981). There are no blackish or olivaceous spots, nor is there any olivaceous tone at all in the background color.

The first egg measured 41.14×28.42 mm, the second 40.09×28.04 mm. These measurements are within those of the 82 eggs in the United States National Museum measured by Bent (1921): length 35.5–45, width 27.5–32.5.

No tern eggs of this particular color abnormality were found subsequently on Great Gull Island until the summer of 1987, when two such sets were found. The two eggs of the first set (site A) were laid on 17 and 19 Jun., and those of the second set (site B) on 6 and 7 Jul. Although there were slight color differences among the eggs, they all conformed to the description above.

We trapped the adults at both sites and subsequently trapped birds associated with red eggs at these sites each year, with one exception, through 1991. Both of the parents trapped in 1987 at site A had hatched in 1984. Subsequently the female of this pair, sexed on the basis of bill length comparison with its mate (Coulter 1986), paired in 1988 with a bird trapped as an adult on Great Gull Island in 1983. In 1989 she paired with a bird hatched in 1984, remaining with this mate in 1990 and 1991. In 1989 and 1990 this pair had red eggs, but in 1991 they were trapped on a late nest, and the egg in the nest was brown, not red.

The 1987 and 1988 mates of the site A female nested with other females subsequently. The eggs in their nests were normal in appearance.

The parents trapped in 1987 at site B were a two-year-old (hatched 1985) and a bird trapped as an adult in 1985. These birds remained together and were trapped on red eggs each year through 1990. In 1991

we trapped the 1985-hatched bird of the pair with a new mate, one that was hatched in 1984, on two red eggs. Bill measurements of the pair at site B in 1987 differed by only one millimeter, so we did not attempt to sex the members of this pair.

In 1990 and 1991 we trapped three adults that had hatched from erythristic eggs. Two had hatched at site A, one in 1988 and one in 1989. On the basis of bill measurement they both appeared to be females. The third hatched from the 1988 nest at the B site, and on the basis of behavior was sexed as a male. All three of these birds were trapped in 1991 on nests in which the eggs were of normal coloration. We will continue to track the females known to lay erythristic clutches as well as their offspring, to try to determine whether there is any pattern of inheritance of this color variant. Egg color in the domestic fowl (*Gallus gallus*) has long been known to be genetically determined; the blue egg shell color of the South American Araucana breed is based on a simple autosomal dominant mutation, but the genetics of brown eggs is more complicated (Hutt 1949). To our knowledge, erythristism has not been reported in that well-studied species.

Given the apparent worldwide rarity of erythristic eggs of Common Terns, the Great Gull Island data permit an estimate of the frequency of occurrence in a large, thoroughly censused colony. In the years from 1966 through 1991, 82,000 nests were marked on Great Gull Island, and these nests included only ten clutches of red eggs. Of the 33,318 adult Common Terns trapped on the island during the same period, we assume half to have been females, and of these, two females were responsible for nine of the known red egg clutches. The female parent of the clutch found in 1975 is unknown, as the nest was not trapped.

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LITERATURE CITED

- BANKS, R. C., M. H. CLENCH, AND J. C. BARLOW. 1973. Bird collections in the United States and Canada. *Auk* 90:136-170.
- BATES, D. J., H. M. S. BLAIR, AND I. H. J. LYSTER. 1976. First recorded erythristic eggs of Arctic Skua and Herring Gull in Britain. *Scottish Birds* 9:143-147.
- BENT, A. C. 1921. Life histories of North American gulls and terns. U.S. Nat. Mus. Bull. 113.

- BORRER, C. 1913. Exhibition of two clutches of red eggs of the Common Tern. *Bull. Brit. Orn. Club* 31:112.
- COOPER, D. M., H. HAYS, AND C. PESSINO. 1970. Breeding of the Common and Roseate Terns on Great Gull Island. *Proc. Linnaean Soc. New York* 71:83-104.
- COULTER, M. 1986. Assortative mating and sexual dimorphism in the Common Tern. *Wilson Bull.* 98:93-100.
- DICOSTANZO, J. 1980. Population dynamics of a Common Tern colony. *J. Field Ornithol.* 51:229-243.
- HUTT, F. B. 1949. *Genetics of the fowl*. McGraw-Hill, New York, New York. xii + 590 pp.
- JOURDAIN, F. C. R., AND C. BORRER. 1914. Erythrism in the eggs of British birds. *Brit. Birds* 7:246-260.
- SMITHE, F. B. 1975. *Naturalist's color guide*. New York, New York. American Museum of Natural History. 8 unnumbered pp. + 8 plates.
- . 1981. *Naturalist's color guide, part III*. New York, New York. American Museum of Natural History. 37 pp. + 9 plates.
- SUTHERLAND, A. 1980. Erythristic Herring Gull eggs in Caithness. *Scottish Birds* 11:84.
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