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A TECHNIQUE TO COLOR-MARK INCUBATING GULLS

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Abstract.—Modification of a method used to mark Cattle Egrets (*Bubulcus ibis*) produced a technique suitable for color-marking Herring (*Larus argentatus*), Great Black-backed (*L. marinus*), and Laughing (*L. atricilla*) Gulls. Gulls marked themselves while incubating artificial eggs treated with a mixture of petroleum jelly and Rhodamine B. Marks persisted on gulls a minimum of 28–42 d. Low levels of mortality (0.05–0.27%) and nest destruction (0.46%) were associated with this technique. Substitution of Malachite Green for Rhodamine B proved ineffective, suggesting this method is best suited for water soluble dyes.

TÉCNICA PARA MARCAR A GAVIOTAS CON COLORES DURANTE LA INCUBACIÓN

Sinopsis.—Una modificación del método utilizado para marcar a garzas ganaderas (*Bubulcus ibis*) produjo una técnica adecuada para marcar con colores a individuos de *Larus argentatus, L. marinus,* y *L. atricilla.* Las gaviotas se marcaron a sí mismas mientras incubaban huevos artificiales tratados con una mezcla de vaselina y rodamina B. Las marcas permanecieron visibles en las gaviotas por un mínimo de 28–42 d. Bajos niveles de mortalidad (0.05–0.27%) y destrucción de nidos (0.46%) fueron asociodos a la técnica de marcar. Una sustitución de la rodamina B por verde de malaquita probó ser inefectiva, lo que sugiere que el nuevo método es más adecuado para tintes solubles en agua.

Paton and Pank (1986) described a technique that permitted the color-marking of large numbers of colonial birds with minimal disturbance. A mixture of silica gel and Rhodamine B powder was placed on Cattle Egret (*Bubulcus ibis*) eggs, and egrets color-marked themselves while incubating. Paton and Pank (1986) suggested this method could be applied to light colored birds, such as other egrets and larids, but cautioned that the effect of the gel and dye mixture on egg survival was unknown. While investigating gull movements, we developed a marking technique, based on that of Paton and Pank (1986), that has minimal effect on egg and adult survival. Here we describe the technique and report on its effectiveness for marking three species of gulls.

METHODS

We used a petroleum jelly and Rhodamine B mixture, introduced to nests on dummy eggs, to mark incubating birds. Dummy eggs were used to avoid potential impacts of dye and gel on egg survival. This method was used to mark Herring (*Larus argentatus*) and Great Black-backed (*L. marinus*) Gulls on Monomoy National Wildlife Refuge, Chatham, Massachusetts (41°37′N, 69°57′W) in 1988, and Laughing Gulls (*L. atricilla*) that nested in Joco Marsh, Jamaica Bay Refuge, Long Island, New York (40°37′N, 73°48′W) in 1990.

We used two different types of dummy eggs. Chicken (*Gallus gallus*)

eggs, emptied of their contents and filled with plaster, were used as dummy eggs in 1988. In 1990 dummy eggs were prepared using hollow, plastic Easter eggs as molds. Although chicken and plastic eggs had similar initial costs, plastic eggs proved more economical because they could be reused. Easter eggs were of two sizes, 65 × 45 mm and 45 × 29 mm (l × w). These sizes reflect the use of Easter eggs from two different suppliers, rather than an attempt to match the dimensions of artificial eggs to those of gulls. Plastic eggs separated widthwise into two pieces, with the seam located at the widest point of the egg. A 25-mm diameter circular opening was cut into the blunt end of the egg (i.e., where the air cell occurs in real eggs) and plaster was poured into the mold through the opening. When dry, the dummy egg was removed from the mold, by separating the mold at the seam, and the plastic egg reassembled and reused.

Preparation of the gel and dye mixture differed from that in Paton and Pank (1986). Rhodamine B powder was combined with water, in the ratio of approximately 428 g/l, to form a paste. This paste was then blended into petroleum jelly to form the gel and dye mixture. The ratio of paste to jelly was approximately 147 g/kg in 1988 and 315 g/kg in 1990. One kg of gel and dye mixture treated approximately 200 nests. Paton and Pank (1986) used an oil-based silica gel but suggested petroleum jelly would act as a similar medium. We used petroleum jelly because of its low cost and high availability.

We also used a non-water soluble dye to mark Laughing Gulls in 1990. Techniques were as described previously, with the exception that a mixture of Malachite Green and 70% isopropyl alcohol, blended 2:1 volumetrically, was substituted for Rhodamine B paste.

To mark a gull, a dummy egg was placed in a nest that contained a two- or three-egg clutch, and an 18-mm-wide by 5-mm-high bead of gel and dye mixture was placed along the length of the egg. Care was taken to prevent gel from contacting natural eggs. Gulls became marked while incubating these artificial eggs. Although individuals could treat nests, teams were used because they more efficiently located nests. Dummy eggs were left in nests at least 24 h, collected, and reused. Collection of dummy eggs permitted identification of responses to the placement of marker eggs in nests. Numbers of gulls marked per nest treated were determined by observing pairs of gulls, where possible, while collecting dummy eggs.

RESULTS

In 1988, we marked 1101 Herring and 192 Great Black-backed Gulls using this technique. The first gull that returned to a nest containing a dummy egg became heavily stained on the breast and abdomen. The area stained expanded over time due to preening and contact with water (Evans and Griffith 1973, pers. obs.). The marked bird's mate received only trace amounts of dye upon incubation. Marks were readily identifiable at a distance, provided gulls' abdomens or breasts could be clearly seen. Repeat visits to sections of colonies treated on known dates indicated gulls remained visibly marked at least 28 d. Marks faded quickly between 28

and 42 d. Little time was required to treat nests. A team of two treated approximately 50 nests/h.

In 1990, we treated 3675 Laughing Gull nests with the Rhodamine B mixture. Unlike the larger gulls, both members of a pair of Laughing Gulls were marked while incubating. The first gull to return to the nest was heavily marked; its mate received a smaller, but identifiable, mark. Marks on both birds increased in area over time. As with the larger gulls, marks on Laughing Gulls were readily identifiable as long as their abdomens and breasts were visible. Repeat visits to the colony indicated marks persisted more than 42 d. Although the marsh location made access to nests difficult, a team of two treated approximately 30 nests/h.

Marking efforts with a non-water soluble dye were of limited success. In 1990 we treated an additional 392 Laughing Gull nests using Malachite Green. Initial marks were small, difficult to detect, and did not increase in area.

Low levels of adult mortality and nest destruction were associated with our method. Dead adults were found on eggs at three (0.27%) Herring and two (0.05%) Laughing Gull nests treated with the gel and Rhodamine B mixture. No gulls were observed dead on eggs at untreated nests. Dead birds lacked external signs of injury. Six (0.46%) of all nests treated in 1988 were known to have been destroyed (i.e., nest materials and eggs disrupted).

DISCUSSION

Persistence of marks differed between years, and between our studies and that of Paton and Pank (1986). Between-year differences were likely due to corresponding differences in the amount of Rhodamine B paste blended into petroleum jelly. A higher concentration of Rhodamine B paste was used in 1990 than in 1988, which may have produced more persistent marks. Paton and Pank (1986) reported marks on Cattle Egrets persisted 2–6 mo. Although this persistence may have been due to dye concentration, it also may have been affected by the egrets' lifestyle. Unlike Cattle Egrets, which are primarily terrestrial, gulls frequently stand and swim in water. This exposure to water may dilute Rhodamine B and reduce its persistence.

The failure of Malachite Green to mark gulls adequately was likely due to its insolubility in water. Exposure to water expanded Rhodamine B marks, but not Malachite Green marks. It is likely that dyes must be water soluble for the area marked to expand beyond that created by initial contact with the bead of gel and dye. Without this expansion, marks are visible only when gulls are flying overhead. This suggests our technique is best suited for water soluble dyes.

Ultimate causes of deaths and nest destruction associated with our technique could not be identified. Evans and Griffith (1973), however, reported that a Great Horned Owl (*Bubo virginianus*), Red-tailed Hawk (*Buteo jamaicensis*) and four Golden Eagles (*Aquila chrysaetos*) fed animals treated with Rhodamine B suffered no adverse affects, suggesting some

birds can safely ingest Rhodamine B. Similarly, pink excretia commonly observed around nests in our studies suggests most gulls safely ingested the gel and Rhodamine B mixture. Observed mortalities may represent ingestion by intolerant individuals or processes other than ingestion. Nest destruction may represent responses of some gulls to the presence of colored dummy eggs in their nests or may have been due to birds not associated with destroyed nests (e.g., predators attracted to colored eggs).

Transferring dye to nesting gulls via dummy eggs is an efficient and effective color-marking technique. Most of the labor required to mark gulls is in the preparation of dummy eggs and mixture of gel and dye. Such preparation can be made outside of the field season, permitting the rapid marking of a colony once nesting begins. We suggest this method is suited for studies that require short-term marking of large numbers of nesting gulls.

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