GENERAL NOTES

A device for color-marking nesting birds.—During the course of an ethological study of the Least Tern (*Sterna albifrons*) in North Carolina, it became necessary to mark the birds for individual recognition. Trapping and banding the terns on the nest was ineffective because, although the birds were easily caught, the majority then deserted their nests. We tried several techniques, including placing dye in bits of shell at the edge of the nest, but these methods were insufficient because of evaporation of the solvent and removal of the colored shells by the birds. The technique presented here was designed, tested, and found useful for marking Least Terns. It could probably be used for other ground-nesting species greatly disturbed by being trapped on the nest. The equipment and supplies used are readily available in any reasonably equipped biology department or variations can be easily obtained by those without institutional affiliations. Other workers have used dye or paint for marking nesting birds (e.g. Emlen, J. T., *Auk*, **71:** 16-35, 1954; Burger, J., *Anim. Behav.*, **22:** 521-567, 1974), but our device appears to have advantages in both ease of use and potential versatility of application.

The apparatus consisted of a 200 ml glass bottle and two pieces of glass tubing, both of which were inserted into a two-holed rubber stopper placed tightly on the mouth of the bottle (Fig. 1). One end of a 50-foot length of ¼ inch rubber tubing was attached to a 3-inch piece of glass tubing (Tube A) that was bent at a slight angle. The other piece of glass tubing (Tube B) was shaped at one end to produce a thin, narrow opening approximately 1/16 inch in diameter. Tube B should be long enough to extend from near the bottom of the bottle to about 3 inches beyond the 90° angle. A plastic bottle and copper or aluminum tubing could be used just as easily.

Several histological dyes were readily available. A 200 ml solution of 70% ethanol and acetone (7:3) was prepared. Approximately ½ g of powdered dye was added to the solution and mixed well. Dyes used successfully included Rhodamine B, Malachite Green, Nile Blue V, and Oil Red 0. Sudan Black B was also tested but it quickly faded to gray after drying and could not be distinguished from the normal gray coloration of the back and wing feathers. This dye would probably be suitable for all-white birds. Although recognizable markings persisted for no longer than two weeks, the ease of marking renders this a negligible problem. However, more permanent dyes would be preferable, such as those used by Forster (*The Ring*, **77:** 99-100, 1973). He squirted "Bird Marking Colour" (Geigy, Basel) from a syringe on free-swimming swans and the markings persisted until the molt.

Least Terns will tolerate a certain amount of disturbance at the nest site. It was thus possible to bury the bottle of dye within one foot of the nest, positioning Tube B so that it was only about one inch above ground level and aimed directly at the nest. By observing which direction an incubating bird was facing shortly before placing the dye apparatus, we could determine how to position the bottle in order to mark a particular area of the bird's body. The rubber tubing was then arranged so that it led in a straight line to a blind. It was not necessary to attempt to bury the exposed rubber tubing; the terns appeared to ignore it.

After incubation had resumed for about five minutes, we blew gently into the free end of the rubber tubing. The pressure was enough to project a stream of dye through Tube B as far as three feet from the bottle and mark the bird distinctly. Only a gentle puff was needed. It would be advisable to test the capabilities of the apparatus before using it on a nesting bird.

By placing the bottle in the appropriate direction from the nest, or waiting until the bird is facing in an appropriate direction, various birds can be marked on different parts of the plumage. The markings produced are also quite variable, thus making it possible to mark individually several birds with only a single dye.

The behavior of the Least Terns marked with this technique seemed to be little affected. Most birds were cautious as they approached their nest for the first time after the apparatus was placed at the nest. However, usually within five minutes after the bottle had been buried and we again returned to the blind, a tern resumed incubation. Occasionally if the bird was facing the exposed glass tubing while it incubated, the bird would briefly peck the tubing. Otherwise, the birds exhibited normal incubation behavior after settling down on the nest.

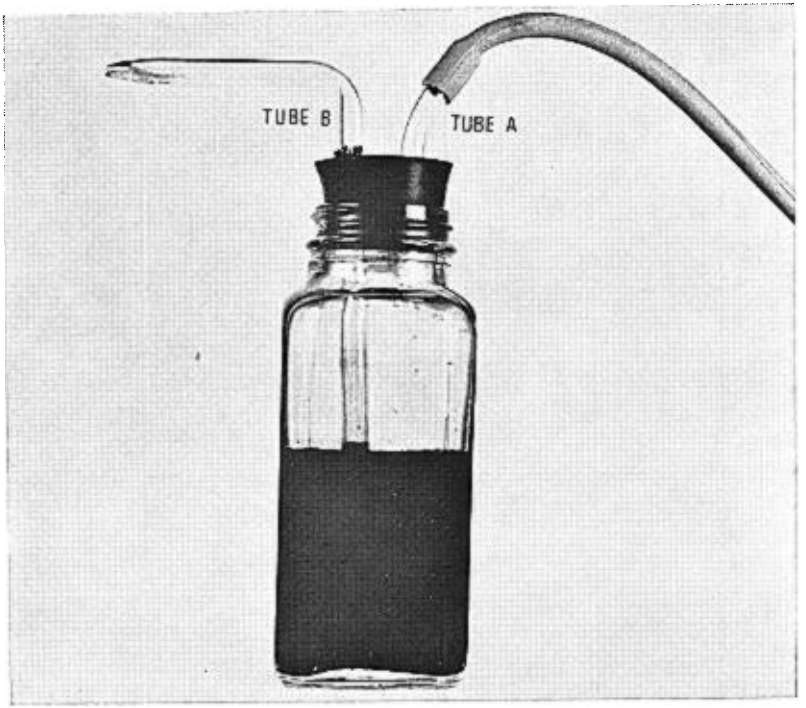

FIGURE 1. Assembled apparatus for color-marking nesting birds.

The actual marking of a tern usually caused it to fly off the nest and disappear for one to 10 minutes. Upon returning to its nest, the bird approached the area cautiously, often inspecting the various small stones and pieces of sea shells that had also been dyed on either side of the nest. Occasionally, a tern would pick up dyed stones or shell pieces in the nest scrape in its bill and fly off with them. Otherwise, except for some occasional preening of the dyed feathers, its behavior was not noticeably modified. None of the birds marked with this technique deserted their nests because of the marking experience.

With slight modifications, this technique could be applied to birds other than ground-nesting species. With an adequate method of securing and perhaps camouflaging the bottle of dye, birds with nests in vegetation could probably be marked with this method. We also believe that a much longer length of rubber tubing, at least as much as 100 feet, can be used successfully. The number of nests that could be marked without having to move the blind would thus be greatly increased.

We thank D. P. Costello and C. Henley for advice and assistance with dyes. This work was carried out while one of us (L. J. M.) was supported by an N.D.E.A. fellowship.—LYNN J. MOSELEY AND HELMUT C. MUELLER, *Department of Zoology, University of North Carolina, Chapel Hill, North Carolina 27514.* Received 30 January 1975, accepted 23 July 1975.

New method for sexing Steller's Jays.—The published literature contains no recognition of sexual dimorphism in the Steller's Jay (*Cyanocitta stelleri*). I have found in the subspecies, *C. s. macrolopha*, a significant correlation between the exposed culmen length and sex. Using this measurement, sex in this subspecies can be determined with a reasonable degree of accuracy at all times of the year. During the pre-incubation period (mid-February to the end of April in the study site six miles west of Boulder, Colorado) when the jays can be observed in couples, the identification of the sexes can be further verified by the