A New Transmitter Package Assembly for Adult Herring Gulls.—In 1978, commercially available transmitters were used to study movements of adult Herring Gulls (*Larus argentatus*) at a colony near Port Colborne, Ontario (Morris and Black, J. Field Ornithol. 51:110–118, 1980). Two problems were identified with the procedures. First, some birds broke off the whip antenna within a few days. This reduced signal range substantially. Second, as battery life is limited, adults recaptured in 1979 required a complete removal of the package and replacement with new equipment. To circumvent these problems, we designed a new transmitter package.

A crystal can containing the transmitter was mounted inside a phenolic resin tube (2.2 cm O.D., 0.16 cm wall thickness, 6.35 cm long; Commercial Plastics, Toronto, Ontario). The end of the tube adjacent to the crystal can was closed with a plug (0.32 cm thick) cut from a solid phenolic resin rod. A small hole, bored in the plug, was later used to tune the transmitter then closed with a circular piece of Scotch #29® fiber-glass tape. The other end of the tube was machined with internal threads to take a removeable threaded polyethylene screw plug (0.48 cm thick) that was slotted on the outside (Fig. 1). A small hole was drilled in the phenolic tube in the center of its length as an exit point for the antenna (7 × 7 braided steel wire, 0.08 cm diameter; Steelplast Can. Ltd., Toronto). The antenna was placed through the hole and positioned under a ribbon of Kevlar 49® (Dupont Co.). Two rectangular "channels" were formed on the underside of the phenolic tube by saturating the Kevlar with epoxy over 2 polyethylene strips laid at right angles to the tube, approximately 3.8 cm apart. Upon drying, the strips were removed, leaving 2 channels for attachment to the preassembled harness (Fig. 1). The battery was inserted into the phenolic tube and one lead from the transmitter soldered to the negative pole. Tightening the polyethylene screw plug activated the transmitter when the positive pole of the battery contacted the bottom of the crystal can. While a solder connection might appear optimal, the mechanical contact permitted de-activation of the unit (following tuning) until the equipment was in place on the bird. Prior to the final tightening, silicon grease was smeared around the grooves of the polyethylene plug and on the threaded section of the phenolic tube to seal against water leaks.

The harness was nylon strapping with regular perforations along its length (Part NA4-167, Weckesser International, Chicago). Two lengths of strapping (approximately 45 cm each) were crossed at mid-point and fastened with a metal rivet. The transmitter was fastened to the harness at the rivet point with self-locking nylon cable ties (Panduit Sta-Strap,® No. SST1. 5M-CP). The antenna was threaded through alternating holes in one length of the harness strapping and fastened through one of the end holes in a loop configuration (Fig. 2). The total package weighed approximately 36 g (<4% of the weight of the lightest bird harnessed).

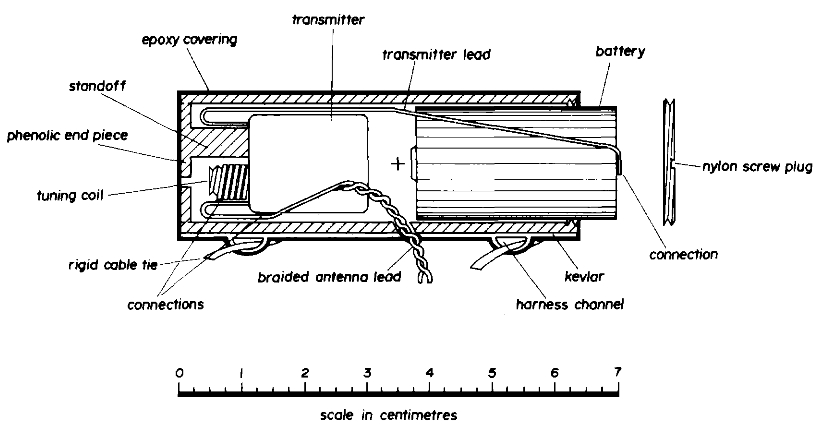

FIGURE 1. Cut-away schematic of the battery and transmitter in relation to the phenolic tubing package.

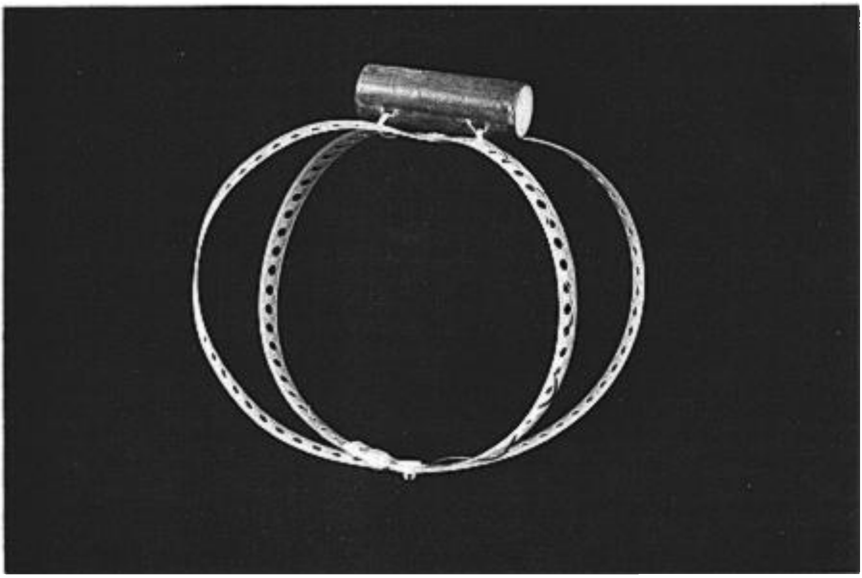

FIGURE 2. The assembled unit with external antenna threaded through the nylon harness.

Adult Herring Gulls were captured during the last week of incubation. The strapping leads were passed around the front and back of each wing, brought together on the upper breast and fastened with stud buttons (Part SA-5NA, Weckesser International, Chicago). The procedure required about 15 min. All birds flew normally upon release and returned to incubate their clutches within 60 min (cf. Morris and Black 1980). In 1979, 15 gulls (from 8 pairs) carried the new package from May until September when the batteries failed. Two of the 15 units developed water leaks. This problem has since been rectified with a tighter seal on the polyethylene plug.

One measure of negative effects of treatment is the mean fledging success of test birds against controls (no trapping or harnessing). The fledging success of 6 control pairs (1.5 chicks per pair) was not different from that of the 8 test pairs (1.3 chicks per pair; Mann-Whitney U test, U = 23, $P = 0.475$). All pairs laid 3 eggs per clutch. Thus, the lightness of the package and capture of adults during the last week of incubation, when investment in the clutch by both members of the pair is substantial, minimized adverse effects of the treatment. Four of the 5 gulls harnessed in May 1978 returned to the colony and renested in 1979. Examination of 3 recaptured birds revealed a minimum of feather wear and skin abrasion. One bird harnessed in May 1979 with the new package style was recovered in September 1979 near Fredonia, N.Y., with fish-hooks embedded in its mouth. No skin abrasions, feather wear, or other adverse conditions were noted (J. Parker, pers. comm.).

We conclude from these observations that the harnessing procedures affect neither the reproductive success nor survival of treated birds. A significant advantage of the new design for long-term studies is that upon recapture, the transmitter is reactivated by simple removal of the polyethylene plug for insertion of a fresh battery. No further adjustment is necessary. As a wide selection of crystals, batteries, harness sizes, and phenolic tubing of various diameters are available, the design should have wide application for use on adult birds of a variety of species.

Summary.—A new packaging assembly for transmitter crystals is described. The primary advantage for long term studies is the ease of battery replacement upon recapture of a harnessed bird. The equipment was used on adult Herring Gulls in 1978 and 1979. There was no difference in the fledging success of harnessed pairs against control pairs.

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Belly-soaking by Incubating Common, Sandwich, and Royal Terns.—Belly-soaking consists of wetting the ventral feathers and transporting water to the eggs or chicks (Maclean, J. Bombay Nat. Hist. Soc. 72:74–82, 1975). It may function in cooling the incubating adult exposed to intense insolation, cooling of the eggs, supplementing the water intake of chicks, and/or increasing nest humidity (Maclean 1975; Grant, J. Bombay Nat. Hist. Soc. 75:148–152, 1978). Experimental studies in the Black-necked Stilt (*Himantopus mexicanus*) suggested that belly-soaking was a response of the parent to cool itself, with the eggs and/or chicks benefiting secondarily (Grant 1979, Ph.D. thesis, Univ. California, Los Angeles).

I observed belly-soaking by incubating Common (*Sterna hirundo*), Sandwich (*S. sandvicensis*), and Royal terns (*S. maxima*) on 25 May 1980 at a mixed-species tern colony near Morgan Island, Back Sound, Carteret Co., North Carolina. From a boat anchored 100 m offshore, I watched undisturbed incubation from 1500 until 1548 at an ambient temperature of about 30°C. The wind was light and the sun was unobstructed by clouds during the observation period. Indicative of the heat stress, most incubating terns were panting. During this time I observed belly-soaking by 6 Common, 2 Sandwich, and 7 Royal terns. During the belly-soaking flights, the incubating bird left the nest, flew to the water, wetted its belly by skimming low over the surface of the water, and returned to the nest. These flights resembled drinking on the wing but were "deeper" flights where ventral plumage appeared to plow through the water. Drinking occurred on most such flights. Most belly-soaking flights resulted in the eggs being exposed for 1 min or less. One Common Tern belly-soaked by dropping vertically from about 2 m above the water in such a manner that the ventral plumage contacted the water first (rather than bill first as in plunge diving). This "belly-first plunge dive" belly-soaking behavior has also been seen in heat-stressed incubating Forster's Terns (*S. forsteri*) at the Salton Sea, California (Grant 1979).

Belly-soaking has not been previously reported in Common, Sandwich, or Royal terns but occurs in many species of terns nesting in hot environments (see reviews by Maclean 1975, Grant 1978, 1979). The stimulus which triggers belly-soaking behavior of incubating terns is still unknown.

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Mate-Swapping of Sandhill Cranes.—Normally, Sandhill Cranes (*Grus canadensis*) mate for life and return annually to the same breeding territory (Walkinshaw, Cranes of the World, Winchester Press, New York, 1973). However, if a pair member dies the other will remate (pers. observ.). On rare occasions an individual has remated while both members of the pair were alive.

On 5 August 1969 a Greater Sandhill Crane (*G. c. tabida*) pair and their 2 young were captured, banded, and released 52 km S of Burns, Harney County, Oregon, on Malheur National Wildlife Refuge (NWR). All 4 cranes were banded above the tibio-tarsal joint with a lock-on U.S. Fish and Wildlife Service band on one leg, and a plain metal band on