disturbances to the nests) was present. This lack of physical evidence and the extent of the colony destruction suggests that the eggs were removed by humans, although our attempts to confirm this proved futile. Despite disappearance of the eggs, the hatching and eventual fledging of 4 chicks can be considered successful in light of the potentially stressful situation induced by the jet activity.

This colony site documentation not only demonstrates the opportunism of *S. a. antillarum*, but also a degree of tolerance to high noise levels and aircraft. This trait has also been noted by Davis (1968), who reported *S. a. browni* nesting very close to a frequently used railroad track. *S. a. browni* has also shown tolerance to disturbance by aircraft at colonies located on 4 California airports (L. Collins, pers. comm.; P. Jorgensen, pers. comm.). When considering the declining populations throughout their range, these 2 qualities, opportunism and tolerance, may be extremely important in determining the future status of the Least Tern.

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ROBERT L. ALTMAN AND ROBERT D. GANO, JR., *Environmental Office, Naval Air Station, Patuxent River, Maryland 20670.* (Present address RA: *3720 NE Highway 20, Corvallis, Oregon 97330*; RG: *1 Paradise Ave., P.O. Box 492, Mt. Airy, Maryland 21771.*) Received 7 Apr. 1983; accepted 3 Nov. 1983.

An Improved Stomach Pump for Penquins and Other Seabirds.—Emetics (e.g., Chaney and Kare 1966, Prŷs-Jones et al. 1974, Radke and Frydendall 1974, Tomback 1975) and stomach pumps (e.g., Emison 1968, Dahlgren 1982) have been used to avoid killing birds to obtain stomach contents for study. However, emetics can cause fatalities (Radke and Frydendall 1974, Randall and Davidson 1981) and the types of stomach pumps used previously may not always give representative samples (e.g., Croxall and Prince 1980).

Many species of seabirds regurgitate when handled, allowing stomach contents to be obtained without killing individuals (e.g., Ashmole and Ashmole 1967). Penguins, unlike most other seabirds, do not regurgitate when handled (J. Cooper and A. J. Williams pers. comm. for 5 species). Until recently, unsatisfactory samples of stomach contents have been obtained for several penguin species using emetics and conventionally-designed stomach pumps (Croxall and Prince 1980, Randall and Davidson 1981, J. Cooper and A. J. Williams pers. comm.). Randall and Davidson (1981) have developed a technique for use with the Jackass Penguin (*Spheniscus demersus*) that involves flooding the stomach with water and then letting the contents drain out through a large tube. This method requires at least two people to restrain the penguin. The associated trauma can cause desertion of eggs or young and the size of prey items that can be recovered is restricted by the internal

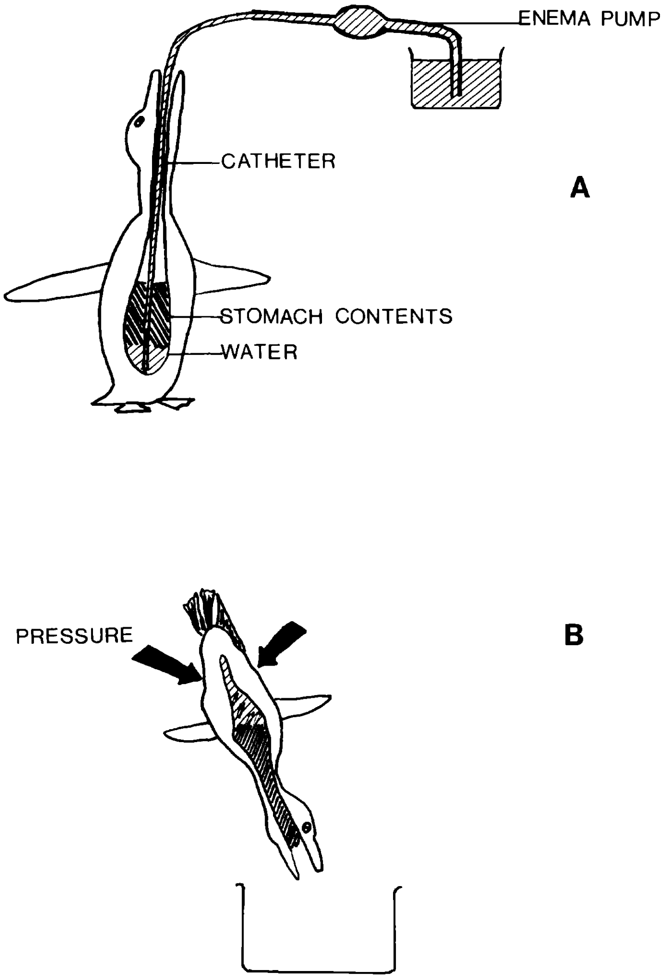

FIGURE 1. Mode of operation of a stomach pump for penguins and other seabirds.

diameter of the tube (pers. obs.). Using a similar pump I obtained only 53% and 91% by mass of the stomach contents of 2 adult Jackass Penguins, verified by subsequently killing the birds.

I describe an improved and much simplified stomach pump for use with penguins and other seabirds. This pump can be used by a single person and usually results in the collection of the entire stomach contents. A 5-mm diameter plastic catheter is pushed down the penguin's esophagus until it reaches the base of the stomach (Fig. 1a). Seawater at ambient temperature is then pumped in using an ordinary enema pump until it begins to flow back out round the sides of the catheter. The catheter is removed and the bird is restrained by both legs with one hand while the other holds the head, the first and second fingers holding the beak open. The penguin is then inverted over a bucket and gentle pressure applied below the bird's rib cage with the knees until regurgitation occurs

(Fig. 1b). When regurgitation appears complete the neck should be massaged gently to remove any items remaining in the esophagus. Occasionally the food mass gets stuck in the buccal cavity. In this case steady pressure on the stomach will stop reswallowing and eventually force the penguin to shake out the remaining contents since these block the epiglottis and prevent breathing.

To test the efficacity of this pumping method, 4 adult Jackass Penguins were stomach-pumped to ensure that their stomachs were empty. This was indicated by green bile in the returned water (Randall and Davidson 1981). The birds were then fed 300g, 200g, 100g, and 50g of anchovy (*Engraulis capensis*), an important prey item of the Jackass Penguin (pers. obs.). Five minutes after feeding, the birds were again stomach-pumped and the contents recovered were weighed. All 4 individuals yielded 100% of the meals fed to them.

From September 1980 to June 1981 approximately 300 Jackass Penguins were stomach-pumped as part of a study of their feeding ecology at Marcus Island (33°03′S, 17°58′E), Saldanha Bay, South Africa. No penguins deserted their nests subsequent to being stomach-pumped. In the 300 samples, 800g was the largest mass of food removed, although most samples weighed less than 400g. The largest prey item was a snoek (*Thyrsites atun*) with a length of 310 mm. Most samples consisted of partially digested fish, cephalopod eyelenses, and beaks. Examination of otoliths and beaks has enabled the stomach contents to be identified to species. Length/mass relationships were then used to estimate the size and mass of individual prey items and to estimate the original mass of the meal.

This stomach pumping method has now been used successfully on King Penguins (*Aptenodytes patagonicus,* N. J. Adams pers. comm.), Gentoo Penguins (*Aptenodytes patagonicus,* N. J. Adams pers. comm.), Gentoo Penguins (*Pygoscelis papua,* G. D. LaCock pers. comm., N. J. Volkman *in litt.*), Adélie Penguins (*P. adeliae* Wilson 1983, G. W. Johnstone *in litt.,* N. J. Volkman *in litt.*), Chinstrap Penguins (*P. antarctica,* N. J. Volkman *in litt.*), Rockhopper Penguins (*Eudyptes chrysocome,* C. R. Brown pers. comm., R. S. C. Horne *in litt.*), Macaroni Penguins (*E. chrysolophus,* C. R. Brown pers. comm.), Royal Penguins (*E. c. schlegeli,* R. S. C. Horne *in litt.*), Blackbrowed Albatrosses (*Diomedea melanophris,* D. J. Leng pers. comm.), Whitechinned Petrels (*Procellaria aequinoctialis,* A. Berruti pers. comm.), and Antarctic Terns (*Sterna vittata,* W. Suter pers. comm.). These initial results suggest that this method can be used on a variety of sizes and types of seabirds, thus obviating the need to kill individuals in order to study their diets.

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R. P. Wilson, *Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Rondebosch 7700, South Africa.* Received 10 Feb. 1983; accepted 7 July 1983.

A Revised Age/Sex Key for Mourning Doves, with Comments on the Definition of Molt.—The current version of the key for ageing and sexing Mourning Doves (*Zenaida macroura*) in the Bird Banding Manual (U.S. Fish and Wildlife Service and Canadian Wildlife Service 1977) contains ambiguities and inaccuracies which can cause both adult (AHY) and hatching-year (HY) Mourning Doves to be incorrectly aged. The problems lie with an ornithologically unorthodox use of the term "molt," and assumption of no geographic variation in the timing of prebasic flight feather molt. These and other ambiguities are corrected below in a proposed revision of the key now appearing in the Bird Banding Manual.

Mourning Doves may be aged externally by 3 criteria. First, juvenal primary coverts have light or buffy edges (Pearson and Moore 1940). Second, the inner margins and tips of the outer juvenal primaries are smooth and light-colored, in contrast to the dark, frayed margins of adult primaries before the fall molt (Wight et al. 1967). If outer primaries have not yet been dropped, summer and fall HY birds can sometimes still be identified even without the distinctive primary coverts. The third ageing method depends upon the timing of prebasic flight feather molt. The fall molt of adult Mourning Doves is on a more or less fixed schedule, while the timing of molt in young birds is relative to their hatching date, which may be quite variable. Working in Missouri, Sadler et al. (1970) suggested that any Mourning Dove having dropped all of its primaries before 1 October is likely to be a HY bird.

The current Bird Banding Manual key uses each of these methods of ageing, including the date suggested by Sadler et al. (1970). Two fundamental errors are made in the use of the third criterion, timing of molt. These are discussed below.

The timing of molt is known to vary geographically in a number of species (e.g., Mewaldt and King 1978, Noskov 1975). For Mourning Doves, Haas and Amend (1979) have compared the timing of primary loss (as part of the prebasic molt) by North and South Carolina Mourning Dove populations to the timing of primary loss by Missouri populations (Sadler et al. 1970). They found that Carolina adults may complete primary loss significantly earlier than Missouri birds. The proposed revised key included here uses the dates of Haas and Amend (1979), minimizing the possibility of incorrectly ageing AHY birds as HY. Examination of the timing of primary loss at additional geographic sites would refine our ability to age birds by date of completion of primary loss.

The current key also errs in its use of the term "molt," causing HY birds that are actively replacing their outer primaries to be incorrectly called AHY. In such cases neither of the first two ageing criteria can be used; both the primary coverts and the outer primaries have already been lost. Such birds can only be aged externally by the timing of the loss of their primaries. In Couplet 4 of the key in the Bird Banding Manual the bander is asked whether or not "primary molt is complete." With one or more feathers on each wing still in sheath, I believe the answer of most banders would be that molt is not yet complete. This answer assigns an (incorrect) AHY age to such a bird, and directs the bander to the next couplet, for sexing according to color of crown, nape, throat, and breast.

The intention of Couplet 4 is to determine whether or not all of the primaries have been dropped, regardless of whether their replacement has been completed (M. K. Klimkiewicz, pers. comm.). A positive answer to a question based on primary loss, rather than "completed molt," leads then to a couplet in which the bird is aged (correctly) according to the calendar date. Sadler et al. (1970 and pers. comm.) used "molt" to mean