WALL, L.E. 1953. Some notes on migrant waders in southern Tasmania. Emu 53: 80-6.

WEIDENBACH, W.W. 1924. Birds noted on a trip to Cowell and the hundred of Mangalo. S. Aust. Orn. 7: 193.

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A NON-DESTRUCTIVE METHOD TO DETERMINE THE DIET OF SEED-EATING BIRDS

We report a novel but harmless method to sample the crop contents of seed-eating birds. During a study of the ecology of Zebra Finches *Poephila guttata* a non-destructive method was required for sampling the contents of the crop. At first an emetic of antimony potassium tartrate was tried at half the dosage rates recommended by Prys-Jones *et al.* (*Ibis* 116: 90-94) but of the three subjects tested two died within 20 minutes and only a few seeds were regurgitated. A method devised by Payne (*Ibis* 122: 43-56) for sampling the crop contents of the Red-Billed Fire Finch *Lagonosticta senegala* consists of inserting a tube into the crop and sucking up the contents with a large syringe. When this method was tried water and digestive juices were obtained but no seeds; they remained in a compacted mass in the crop. We then devised our tube insertion method.

TUBE INSERTION METHOD (TIM)

To extract seeds from the crops of Zebra Finches we used a 60 mm length of plastic tubing of 2.7 mm external and 1.8 mm internal diameter. Size 02 bands from the Australian Bird Banding Scheme come on such tubing. To reduce abrasion on the walls of the crop and oesphagus the tube should not be too stiff or inflexible and the end should be carefully smoothed. On the other hand, if the tube is too flexible it is difficult to insert and to push into the seeds.

The crops were examined first by blowing away feathers at the back of the neck in order to see the contents. Grassfinches have two sections to their crop, one on the right side that receives food first and one on the left that passes food into the gizzard. The crop walls are transparent and individual seeds can be clearly seen. If a crop section was less than one quarter full it was difficult to sample its contents.

The bird was held as for banding but the head held firmly; the tube was inserted into the beak and gently pushed down into the crop where it could be clearly seen. To collect seeds the end of the tube was pushed towards the wall of the crop and at the same time the wall was pushed down with a finger, forcing any seed in between up into the tube. The process was repeated and up to ten seeds could be pushed in before the tube was withdrawn. Both sides of the crop were sampled this way. Particular seeds can be selected for removal or the tube can be used without any visual guidance so that selection of seeds may be random. The seeds were expelled into a seed envelope by blowing the other end. The method was more easily executed when there was a small amount of fluid in the crop. The crops of nestlings over ten days of age could easily be sampled. All seeds had their husks and seed coats removed by the birds. The seeds were later identified by the Seed Purity Laboratory at the Burnley Horticultural College, Victoria.

Difficulties.

It may be hard to prise open the beak. We used the side of the tube to push up the tip of the upper mandible, then twisted the end of the tube inwards. The tongue must be avoided. The diameter of the tube also limits the size and shape of the seeds that can enter. Small round seeds entered more easily than long narrow ones.

Sampling reliability

To test whether we obtained a representative sample of the contents of the crop by the TIM we compared the sample obtained on dead specimens (that had died from other causes) with the contents of the crop when it was dissected out. In four of the five specimens studied there was no significant difference in the proportion of seed types found by the two methods (Table I). In Subject 3, item b was not found in the TIM sample, however, these were not seeds but aphids.

Effects on mortality

No direct effects on the mortality of adults and nestlings have been detected in the course of our 18 month long study. Once the tube was removed all the adult birds flew away immediately (N = 545). The TIM also did not affect rates of recapture at a baited walk-in trap. The recapture rates (52%) of birds that had their crops sampled did not differ significantly from those (60%)

TABLE I

Comparison of proportions of seed types sampled by the Tube Insertion Method and the proportion found when the crop was dissected out.

Subject	Seed types	Numbers in crop	Numbers in TIM sample	Significance
1	a	90	29	
	b	91	21	
	c	28	2	$\chi^2_3 = 4.77$
	d	15	3	$p > 0.10$
2	a	263	39	Fisher Exact Test
	b,c,d,e	29	4	$p = 0.57$
3	a	124	52	Fisher Exact Test
	b	14	0	$p = 0.02$
4	a	296	28	$\chi^2_1 = 2.85$
	b	99	7	$p >> 0.10$
5	a	645	47	
	b	125	9	$\chi^2_3 = 2.85$
	c	23	0	$p >> 0.10$

whose crops were not sampled (χ^2 test for independent samples $\chi^2_2 = 0.14$, $p > 0.90$, $N = 74$).

The effect of the TIM on nestlings was tested on the offspring of captive Zebra Finches. A comparison was made between two nestlings in the same clutch. At day 10, when they weigh around six grams, two nestlings were matched for size and one had ten seeds removed by the TIM. Both had their toes clipped for identification. At day 20 both subjects were weighed and the date of fledging noted. There was no significant difference between the eleven pairs studied (Paired t test $t_{10} = 1.383$, $p >> 0.10$, two tailed). There was no difference in the date of fledging.

DISCUSSION

The TIM should be applicable to other granivorous species of birds. It appears fairly reliable in its sampling of the diet although it probably underestimates the proportion of large seeds, insects and green leaf material. The internal diameter of the tube is the most important factor in determining the size of food items sampled and should be as large as the proportions of the oesphagus permit. It is also possible that different items pass at different rates through the crop so giving a biased sample with the TIM, however visual examinations of many crops of Zebra Finches show that, irrespective of size, the last type of food eaten lies at the anterior part of the crop. This suggests that items of all sizes pass through the crop at the same rate.

We did not sterilize the tube between subjects but this may be advisable in some cases. The stomach flushing method recently described by Ford *et al.* (*Corella* 6: 6-10) has been shown to work on seed eaters, namely two individual Diamond Firetails *Emblema oculata*. We believe that the TIM is simpler and offers less risk, however in cases where the crop is full of dry compacted seed it may help to inject a small quantity of water before withdrawing seed with the TIM.

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