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COMPARISON OF METHOXYMOL, ALPHA-CHLORALOSE AND TWO BARBITURATES FOR CAPTURING DOVES[1]

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ABSTRACT

Secobarbital sodium, methohexital sodium, methoxymol, and alpha-chloralose were used in field experiments to capture mourning doves (*Zenaidura macroura*) in Florida during 1966 and the spring of 1967. A total of 240 doves was caught. The four drugs are compared and the best dosage for each is given. Methoxymol proved superior to the others.

* * * * * *

Increased interest in mourning dove hunting in recent years has stimulated research activity on the species which involves a considerable amount of trapping primarily for banding purposes. One of the most practical ways to capture mourning doves has been with conventional cage-type wire traps, one version of which is described by Winston (1954). Wire cage traps are limited as to the number of birds which can be caught at one time in an individual trap and there is often a certain amount of physical injury to the birds due to impact with the wire which results from frantic efforts to escape. And there are situations in which wire traps cannot be used profitably, such as around cattle or other large livestock where traps may be damaged or in urban situations where the doves may be disturbed excessively in unattended traps by cats and dogs.

This study was undertaken to determine the feasibility of using oral anesthetics to capture mourning doves.

Oral anesthetics, hypnotics, and similar drugs promise to revolutionize trapping techniques for some of the more wary birds. Orally adminis-

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tered drugs have been used in experiments for some time, but only very recently have they been developed as workable capture methods. These drugs have a considerable number of advantages in wildlife study. Sedation reduces the chances of damage to the animal resulting from forced restraint. Elimination of excitement reduces the physical and mental distress as well as the physiological and psychological complications arising from fright and shock. Less paraphernalia is required when narcotics are used and there may be considerable financial savings.

The use of drugs as a capture technique was apparently first tried in this country by H. M. Wight (undated multilith, about 1953). He experimented with Avertin (a tribromoethanol anesthetic by Winthrop Laboratories) on mourning doves, and suggested further research on the technique for capturing game birds with narcosis-producing drugs. Limited experiments were conducted by Mosby and Cantner (1956) on penned and wild turkeys (*Meleagris gallopavo*) and other animal species. Ridpath et al. (1961) experimented with chloralose on birds and found the alpha isomer to be useful for capturing wood pigeons (*Columba livia*). Murton, Isaacson, and Westwood (1965) anesthetized wood pigeons successfully near nests with alpha-chloralose. Williams (1966) and Williams, Austin, and Peoples (1966) describe a technique in which wild turkeys were safely captured in large numbers with alpha-chloralose. The capture of Canada geese (*Branta canadensis*) with alpha-chloralose is described by Crider and McDaniel (1967).

Lovett Williams, Research Supervisor, has been helpful in many ways with this study and furnished four of the photographs in Fig. 1. Acknowledgment is also extended to Jim Brogdon and Russell Stewart, graduate students at the University of Florida, for their assistance with the field trials. Several Game and Fresh Water Fish Commission personnel on Pittman-Robertson Project W-41-R assisted in important ways, especially with the field tests. The following pharmaceutical companies kindly furnished samples of their respective drugs for this study: Elanco Products, Division of Eli Lilly Company (methohexital sodium; trade named Brevane); and Lilly Research Laboratories, Eli Lilly Company (secobarbital sodium; trade named Seconal). Dr. R. Marsboom of Janssen Pharmaceutica, Beerse, Belgium, suggested methoxymol and provided the original sample which led to this study. Dr. George C. Scott of Vetco laboratories, a Division of Johnson and Johnson, was very helpful with his interest and samples during the time his laboratory was working with methoxymol. Recent samples of methoxymol have been furnished by McNeil Laboratories through the courtesy of Dr. John Kleis.

MATERIALS AND METHODS

Pre-Baiting

Various types of grain were used to attract doves to a selected site. A mixture of wheat and cracked corn was found to give satisfactory results in this study and was used in all baiting and drugging experiments. The small particles of cracked corn and wheat offer more surface area per unit of weight for adherence and absorption of the drugs and required the birds to remain at the bait site longer to get a cropful. Doves prefer to light in the trees and observe the bait site prior to flying down to eat. Open areas with trees or electric lines or fences nearby were chosen as bait sites. The selection of cleared areas proved helpful in the observation of narcotized doves. For at least a week before drugging was attempted the bait was presented in small piles distributed throughout the bait site to condition the doves to taking bait presented in that manner. After a sufficient number of doves began using the site, a blind was built for the observer approximately 50 yards away. No changes were made to the intended capture site leading up to and during the actual drugging operations.

Preparing the Bait

Dosages of secobarbital sodium, methohexital sodium, and methoxymol used in these experiments were weighed on an analytical balance, put into solution with water, poured over a measured amount of wheat

and cracked corn and mixed thoroughly. Alpha-chloralose is not very soluble in water. When it was used the bait was dampened with water or Wesson Oil, and the powdered drug was sprinkled over the bait and mixed thoroughly.

In every case the bait was prepared within 24 hours of the time of its intended use. The amount of bait prepared depended upon the number of doves using the bait site. Approximately one cup of treated bait was prepared for each 20 doves anticipated.

Presenting the Bait

Most field trials were conducted during the afternoon. Early morning trials were attempted but success was lower, possibly because the barbiturates and methoxymol were more distasteful in the more humid morning atmosphere. Rainy or misty days also resulted in poorer success.

When capturing was attempted, the untreated bait was removed from the bait site and replaced with bait treated with a drug. The treated bait was presented in small, scattered piles exactly as the untreated bait had been. When the treated bait was presented in a single pile at the bait site there was considerable fighting among the birds resulting in fewer birds being captured.

After each experiment the bait was carefully removed with a portable household vacuum cleaner. During these experiments an observer was present to care for the drugged birds since narcotized doves would be vulnerable to predation.

Equipment

Equipment used in this study was: analytical balance, measuring cup, container with lid, vacuum cleaner and DC generator, holding box, and a long-handled dip-net.

RESULTS

Narcosis

The symptoms produced by the drugs tested in this study were similar. They are illustrated in Fig. 1 and defined in Table 1. The

TABLE 1. HYPNOTIC STAGES DEFINED FOR THE MOURNING DOVE.

Stage I.	Light sedation: unnatural posture; short periods of alertness, able to fly well; cannot be captured.
Stage II.	Heavy sedation or mild narcosis: muscular incoordination and tendency toward disassociation from the unnarcotized portion of the flock; sometimes rests on breast; preening and ruffling of feathers; may fly short distance; difficult to capture by hand.
Stage III.	Moderate narcosis: usually rests on breast; most muscular coordination lost; purposeful movement feeble or absent; usually can be captured by hand or easily with a dip-net.
Stage IV.	Deep narcosis or anesthesia: easily captured by hand.

first reactions were characterized by reduced feeding activity and short periods of alertness. As an affected bird approached Stage II it would stop feeding and begin to ruffle its feathers and preen. Those that reacted normally during narcosis and were not frightened from the bait site usually did not travel out of sight after reaching Stage II.

Capture

In Stage III the birds showed little wariness and could be captured with a long-handled dip-net if approached carefully. Unless there were pressing reasons to capture them sooner, they were left alone until they reached Stage IV. When the "pick-up" was attempted the birds in Stage III were caught first, with a dip-net.

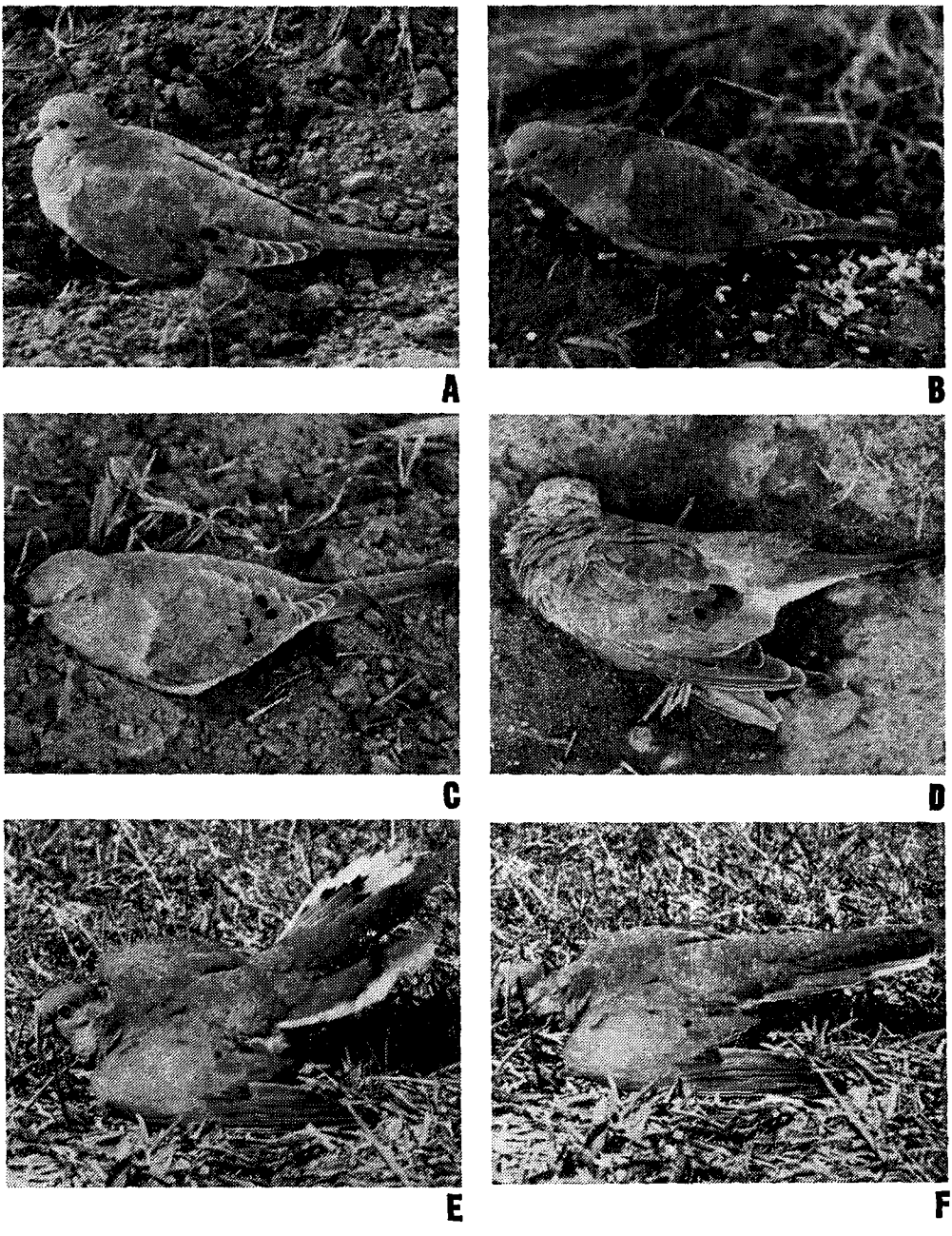

Figure 1. Mourning doves in stages of narcosis. A. Stage I. B. Stage II. C. Stage III. D. Stage IV. E. Stage III, typical of methoxymol. F. Stage IV, typical of methoxymol.

Handling After Capture

After the birds were picked up in the field they were transferred to a closed, cardboard box with care not to overcrowd them. They were later banded and returned to the box. When the banding was completed, the box was placed in a shady area to prevent overheating of the doves. The birds were released as soon as they were fully awake. Birds caught in late afternoon often did not completely recover until after dark. In these cases the birds were released the next morning.

Drugs Tested

A brief review of literature on drugs suggested that alpha-chloralose, methoxymol, secobarbital sodium, and methohexital (see descriptions below) would be suitable candidates for the purposes at hand. A workable dosage was obtained for three of the four drugs tested, but the characteristics of the four drugs differ greatly.

Methoxymol.—Methoxymol is a new imidazole derivative appearing as a white, microcrystalline powder which is odorless and has an acidic, astrigent taste. On damp, wet days or in the early mornings, this taste was easily detected by doves and resulted in reduced capture success. On dry days methoxymol was effective, fast acting, and produced few mortalities.

The hypnotic effects of methoxymol were of short duration and were accompanied by total loss of coordination. Methoxymol is highly soluble in water. It proved superior to the other drugs in this study (Tables 2 and 3).

Methohexital Sodium.—Methohexital sodium (Brevane) is an ultra-short-acting barbiturate which is metabolized rapidly. It is a fairly stable drug produced in powdered form and is readily soluble in water. Methohexital sodium was fast-acting and effective, resulting in only a moderate amount of overdosage mortality. It compared closely in effectiveness to methoxymol (Tables 2 and 3).

Secobarbital Sodium.—Secobarbital sodium (Seconal) is a barbiturate of moderately short duration. Seconal as a sodium salt is a hygroscopic powder which is soluble in water and alcohol. It produced reasonably quick anesthesia and smooth rapid return to consciousness in doves. However, at a safe dosage the speed of entering anesthesia was considerably slower than with methohexital sodium or methoxymol (Tables 2 and 3).

Alpha-Chloralose.—Alpha-chloralose is an anesthetic which can be prepared by heating anhydrous glucose with anhydrous chloral in a water bath (Lumb 1963:199). Alpha-chloralose is practically insoluble in water with minimal taste compared to the other drugs tested in this study. The reaction delay time, however, is very slow (Tables 2 and 3). Alpha-chloralose can be purchased from several large chemical companies.

TABLE 2. RESULTS OF FREE-FEEDING TRIALS.

Drug	Dosage	Number Captured	Number Died	Time Delay Stage I	Time Delay Stage III	Approximate Recovery Time
Methoxymol	1.00 g/cup	18	0	8 min.	11 min.	4 hr.
	2.00 g/cup	7	1*	5 min.	10 min.	5 hr.
		35	4*	5 min.	10 min.	5 hr.
		27	2*	5 min.	10 min.	5 hr.
	3.00 g/cup	14	6	4 min.	8 min.	5 hr.
Methohexital Sodium	0.85 g/cup	3	0	15 min.	45 min.	3 hr.
	1.25 g/cup	43	5*	4 min.	12 min.	3½ hr.
	1.50 g/cup	21	4	3 min.	10 min.	3½ hr.
	3.00 g/cup	4	3	3 min.	5 min.	4 hr.
Secobarbital Sodium	1.00 g/cup	2	0	20 min.	35 min.	3¼ hr.
	1.25 g/cup	23	4	13 min.	24 min.	3 hr.
	1.50 g/cup	26	12	8 min.	20 min.	4¾ hr.
Alpha-Chloralose	0.66 g/cup	6	0	15 min.	30 min.	14 hr.
	1.00 g/cup	11	3	18 min.	35 min.	23 hr.

* Six of the seven mortalities resulting from methoxymol at two grams per cup were very young birds and may have been unduly susceptible to overdose. Likewise, with methohexital sodium at 1.25 grams per cup of bait, two of the five mortalities were very immature.

TABLE 3. DRUG RATINGS AND DOSAGE SUGGESTIONS

Drug	Rating	Suggested Dosage Grams of Drug Per Cup of Bait	Approximate Mortality Rate	Time Delay		Approximate Recovery Time
				Stage I	Stage III	
Methoxymol	Very Good	1.50 to 2.00	Less than 6%	4-5 min.	10 min.	5 hr.
Methohexital Sodium	Good	1.25	Less than 8%	4 min.	12 min.	3½ hr.
Secobarbital Sodium	Satisfactory	1.25	Less than 16%	13 min.	24 min.	3 hr.
Alpha-Chloralose	Unsatisfactory	1.00	More than 20%	18 min.	35 min.	23 hr.

DISCUSSION

Continued search may reveal safer drugs which react faster. A drug with decreased reaction delay time without undue mortality would be desirable. Techniques for removal of crop contents would reduce the mortality rate. The greatest weakness in this technique is the uncontrollable movement of wild birds and the constant threat of partially drugged birds being frightened off the bait site and lost from view. Some birds left the bait prematurely and were probably unestimated mortalities in this study. The faster the reaction time the less the chances are that the bird will leave the bait site before being captured.

Very little is known about the physiological effects of these drugs on mourning doves, however, no undesirable after-effects are believed to exist. Secobarbital sodium is detoxified in the liver and serious after-effects are not known in humans. Methohexital sodium has been used in veterinary medicine on dogs and cats to produce sedation with no ill-effects. Lovett Williams (1966) noted that turkeys were anesthetized with chloralose five times in a period of two years with no obvious side effects and Williams et al. (1966) showed that chloralose anesthesia had no effect on the hatchability of eggs from penned turkeys. Marsboom, Mortelmans, and Vercruysse (1964) noted that methoxymol was injected into several species of birds with no dangerous side effects.

Novices should exercise caution with this technique and preferably work with small flocks of birds or with someone experienced in the use of similar drugs on wildlife before attempting large-scale capturing operations.

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