

each was recorded for tabbed and untabbed traps in November of 1965. The tabs apparently had no ill effect on trapping success, as 41 of the 71 animals caught were captured in treated traps; 92.7% of all animals caught in tabbed traps ingested the affixed capsule. Tabs were also shown to be relatively weather-proof during preliminary investigations.

Results of a chi square test applied to data gathered during the 1965 "census" indicated that the use of such tabs significantly reduced trap damage (0.5% confidence level) suffered by steel-trapped animals, and thus should contribute to more efficient recapture census data.

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PROGRESS IN CAPTURING TURKEYS WITH DRUGS APPLIED TO BAITS¹

By LOVETT E. WILLIAMS, JR., DAVID H. AUSTIN, and JERRY PEOPLES
Game and Fresh Water Fish Commission, Wildlife Research Project,
Suite 21, 412 N. E. 16th Avenue, Gainesville, Florida 32601

A recent article (Williams 1966) reported results of field trials in Florida during late 1964 and early 1965 to develop a technique for capturing wild turkeys (*Meleagris gallopavo*) with alpha-chloralose administered on bait. About 260 turkeys had been captured with alpha-chloralose at the time of that report. Since then 573 more have been captured with alpha-chloralose and 83 with another drug.

Chloralose is a relatively tasteless, white powder of low solubility in water. It is related chemically to chloral. The alpha isomer is responsible for the compound's sleep-inducing qualities (Borg 1955: 118). Alpha-chloralose can be purchased from Fisher Scientific Company, 690 Miami Circle, N. E., Atlanta, Georgia 30319; Nutritional Biochemicals Corporation, 21010 Miles Avenue, Cleveland, Ohio 44128; or British Drug Houses, Canada Ltd., Barclay Avenue, Toronto 18, Ontario.

Information about the drug's history, chemical nature, and effects on some species of animals is available from Lumb (1963), Murton, et al. (1963), Borg (1955), and in the references listed by them. Its use for capturing Canada geese is reported by Crider and McDaniel elsewhere in these proceedings.

Through personal communications we have learned that alpha-chloralose is being used experimentally on turkeys and other species elsewhere in the United States, but we have not attempted to learn how widely the technique is being employed at this time.

After anesthetizing nearly 1,000 wild turkeys with orally administered drugs during the past two years, we are able to suggest some important considerations for the successful use of alpha-chloralose and similar compounds to capture wildlife. We will describe the current capturing technique; suggest caution against some of its drawbacks; present some preliminary information on a new and possibly better drug called methoxymol; and suggest a few facets which need further investigation.

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CURRENT TECHNIQUE

To keep the report reasonably short we assume that we are addressing specialists who are familiar, at least to some extent, with wild turkeys and how to catch and handle them. Pre-baiting, presentation of treated bait, narcotic induction, and capturing and handling after capture will be taken up separately.

Site Selection and Pre-Baiting

1. Sites offering good visibility of the immediate surroundings at ground level should be chosen for baiting, preferably without many trees or other obstructions within about 200 feet. Nearby fences are especially hazardous when lightly narcotized turkeys attempt to fly.

2. Bait sites should be located close enough to roosting places to enhance the probability that the flock will visit the bait in early morning, but the site should be far enough away from the roosting area to preclude disturbing the turkeys unduly during pre-baiting operations.

3. Turkeys should be baited to the capture site until they are using it at about the same hour each day.

4. Bait should be presented in piles of about $\frac{1}{2}$ cup. Coarse cracked yellow corn is recommended for bait, if turkeys will accept it, and should be used for pre-baiting, but other baits may be satisfactory. Bait piles should be spaced far enough apart to reduce disturbance among unsociable turkeys. Three-foot spacing has proven satisfactory for us.

5. Observation blinds which completely conceal the trapper should be erected about 100 feet from the bait site with a good view of the bait area and surroundings. We use small canvas tents or tractor umbrellas draped with double layers of insect netting, furnished with chairs. Long hours in the blind are often necessary—the observer should be comfortable so that he can operate efficiently and without distraction.

6. Pre-baiting should be done, at least in its final stages, by the individual who intends to catch the turkeys.

7. No changes whatever should be made in the site or pre-baiting procedures for at least three days preceding the capture attempt.

8. Some other hazards associated with site location include: possible drowning of narcotized turkeys when sites are near water; disturbance by people who are not associated with the trapping operation; and harassment of narcotized turkeys by predators and unnarcotized turkeys.

Preparation and Presentation of Treated Bait

Several different drug-to-bait ratios between 1 gram per cup of bait and 5 grams per cup have been tried in free-feeding field trials. Depending upon appetite, natural resistance, and other factors, individual turkeys will sometimes consume little enough of a heavier dosage (e.g., 5 grams per cup of bait) and recover satisfactorily from anesthesia. Conversely some individuals will eat a sufficient quantity of a very light dosage (e. g., 1 gram per cup of bait) to be captured. But the latter situation is less frequent. We have field-tested a dosage of 1.5 grams of drug per cup of bait in several free-feeding trials. This dosage too often resulted in a portion of the flock being not sufficiently narcotized for capture. Nearly every time this dosage was used, a long-handled dip net and extremely careful approach were essential to capture any of the turkeys. Adult males—probably because of their larger size—are more difficult to capture on lighter dosages of alpha-chloralose than are smaller turkeys. At this point, 2 grams of alpha-chloralose per cup of bait is the dosage we recommend for wild turkeys. Heavier dosages have consistently resulted in mortality rates usually exceeding 10 per cent.

We have used vegetable oils, Coca-Cola, and sugared water to stick alpha-chloralose powder to bait but cannot say that they hold any outstanding advantage over water alone. Bait should be lightly wet with

water or other "sticker" a few minutes before the powdered drug is stirred in. Stirring the drug slowly into the bait enhances a homogeneous mixture. When the bait is very wet, too much of the powdered drug will usually stick to the sides of the container or settle out into the excess water in the bottom. Wet bait should be permitted to stand for a few minutes so that the excess water absorbs into it before the drug is stirred in.

On the morning of the capture attempt, the bait with drug applied should be laid out in small piles exactly as it was during pre-baiting, advisably before daylight. All foreign objects should be removed from the scene. If other animals become narcotized at the site before the arrival of the turkeys, they should be removed if this can be done without a great risk of disturbing the turkeys, because narcotized animals often frighten turkeys away from the bait site.

Capture attempts with alpha-chloralose in mid-day and afternoon are not advisable because of the possibility that anesthetized birds will not be recovered before darkness.

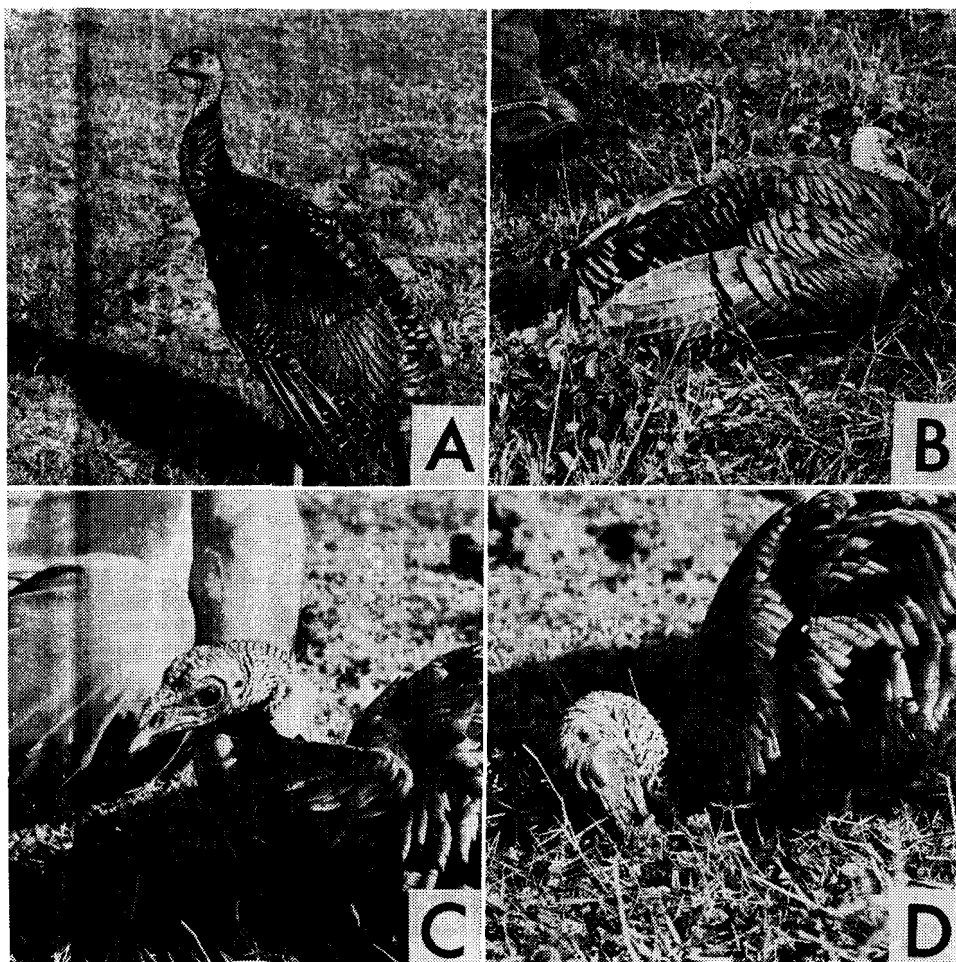


Fig. 1. Wild turkeys in four stages of narcosis. A. Stage I, about 45 minutes after dosage. B. Stage II, about 70 minutes after dosage. C. Stage III, about 100 minutes after dosage. D. Stage IV, about 150 minutes after dosage.

Behavior and Narcotic Induction

When turkeys have been carefully pre-baited they usually visit the site soon after sunrise. Turkeys which have not previously visited the site are often wary of the bait—usually too wary to feed properly. They often react the same way when they find the usual type of bait placed in piles for the first time or find cracked corn when they are accustomed to whole grain corn. Sometimes in these situations they will feed sufficiently but more often they will not. A few unsuccessful trapping efforts on one of these accounts will emphasize the importance of proper pre-baiting.

When turkeys feed steadily on drug-treated bait, the first signs of narcosis occur after about 30 minutes. Figure 1 shows turkeys in the four typical alpha-chloralose narcotic stages. The stages are defined in Table 1. Turkeys usually continue to feed after reaching Stage I, but

TABLE 1. HYPNOTIC STAGES DEFINED

Stage I.	Light sedation: unnatural posture; imbalance; able to run or fly.
Stage II.	Heavy sedation: characterized by muscular incoordination and tendency toward disassociation from the un-narcotized portion of the flock; often rest on breast; sometimes can be closely approached by a man; tendency to stagger backwards; difficult to capture by hand.
Stage III.	Muscular collapse: most muscular coordination lost; purposeful movement feeble; can be captured by hand.
Stage IV.	Deep narcosis or anesthesia.

less avidly, and they experience difficulty in maintaining normal posture. Feeding usually ceases after about 45 minutes, at which time they preen their ruffled feathers and begin to stand still or move slowly about—sometimes in circles—as Stage II sets in. Those that react normally during narcosis and are not frightened from the bait site will usually not travel more than 100 yards after reaching Stage II.

Capturing

Turkeys in Stage III can be captured with long-handled dip-nets but unless there are pressing reasons to capture them early, they will be easier to catch and handle if given enough time to reach Stage IV. When all of the turkeys in the flock have progressed to Stage III or Stage IV which is normally about two hours after feeding—they should be taken. Any under lighter sedation should be picked up first. (Even heavily narcotized turkeys sometimes struggle when handled roughly.)

With experience, a trapper will learn to handle the chaotic situations which may develop when a portion of the flock is not sufficiently narcotized. Our procedure in these cases is to remain in the blind for about two or three hours awaiting Stage IV. It is sometimes necessary to leave the blind in order to observe turkeys which have wandered from view. After this period, those which have not reached at least Stage II (and cannot be captured with a dip-net when approached carefully) can probably not be captured at all. They will probably recover fully before night when the trapping operation is carried out in early morning. (Turkeys captured in Stage II and held in confinement were usually wide-awake within five hours.)

To avoid unintentionally narcotizing late-visiting turkeys and other wildlife, all unused bait should be removed from the site.

A very good, light, long-handled, wide hoop, aluminum dip-net can be obtained from Ed. Cumings, Inc., 2305 Branch Road, Flint, Michigan 48508.

Handling after Capture

During the initial experimentation with alpha-chloralose on turkeys, we routinely administered sodium pentobarbital intramuscularly to facilitate the handling of turkeys which had reached a stage of narcosis

deep enough for capture but were too easily aroused to handle unconfined. This was most often necessary with adult gobblers. Last winter several turkeys died after injections of pentobarbital when their alpha-chloralose dosage and stage of narcosis were believed to be insufficient to cause death. We now think that overdosage of pentobarbital has been responsible for a portion of the mortality which had been blamed on alpha-chloralose. Because of this we have discontinued the routine administration of pentobarbital in conjunction with alpha-chloralose anesthesia and now confine narcotized turkeys in boxes immediately upon capture. Intramuscular injections of pentobarbital (not exceeding 1 cc per five pounds of body weight) are used now only when other means of containment are not available.

When turkeys, narcotized or not, are confined too closely in small containers especially with their legs tied, some of them are likely to experience paralysis in one or both legs while remaining apparently healthy in other respects—even maintaining the ability to fly if helped off the ground. Occasionally turkeys in this condition have been confined for observation and a few have recovered satisfactorily after a few days but usually the condition is permanent. To prevent it, we do not employ the old practice of transporting turkeys in burlap sacks with their tarsometatarsi tied together. We use a strong, weather-proofed box designed for wild turkeys by the St. Regis Paper Company at Jacksonville, Florida. It is a paraffin-treated cardboard box measuring in inches, 30 x 17 x 12, with overlapping ends and handholes in each side (Fig. 2). One can be used several times. The waterproof material does not absorb moisture which makes it necessary to place a piece of ordinary corrugated cardboard in the bottom of the box when in use to absorb moisture from the excrement.

Turkeys should be kept warm and dry during anesthesia. Body temperatures rise sharply (sometimes to 108°F.) soon after Stage IV is reached and then decline gradually for several hours (to as low as 93°F.). We were not aware of the danger of chilling in southern Florida until 13 turkeys in deep anesthesia died one night when the air temperature dropped to about 31°F. Provisions for keeping anesthetized turkeys warm may be of special importance in cooler climates.

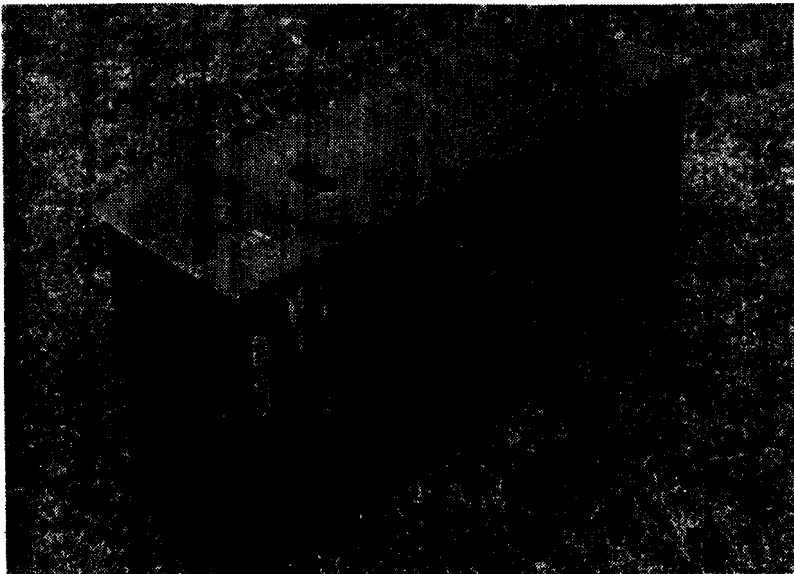


Figure 2. Paraffin-treated cardboard box for holding and shipping wild turkeys.

METHOXYMOL

A new imidazole derivative called methoxymol (R-7315) by Vetco Laboratories, a subsidiary of Johnson and Johnson, produces a strong hypnotic effect in birds. Dr. George C. Scott, Vetco's Director of Research, generously supplied us with powdered methoxymol for experimentation on wildlife.

Last winter 83 turkeys were captured with methoxymol. Table 2 summarizes the results on three different bait dosages initially tested on free-ranging turkeys on 17 January 1966. The data in Table 2 involve 77 birds visiting the three bait sites. Only 21 were captured. The reason so few of those visiting the bait sites were captured is probably because the drug is distasteful to turkeys. Most of them would not feed after first tasting the bait. Other dosages of methoxymol were tested on wild turkeys during January and February and a dosage much lighter than any of the three listed in Table 2 appears to be effective with a tolerable rate of mortality (about 5% in a small sample).

TABLE 2. SUMMARY OF A FIELD TEST WITH METHOXYMOL TO CATCH WILD TURKEYS, 17 JANUARY 1966.

Dosage rate	Visited Site	Number of Turkeys					Captured	Died
		Ate Bait	Stage I*	Stage II	Stage III	Stage IV		
8 g/1.5 cups corn	19	2	0	1	0	1	1	0
10 g/1.5 cups corn	18	6	4	0	0	2	2	0
15 g/1.5 cups corn	40 plus	about 25	(Data not recorded for Stages I & II)		0	18	18	3
Totals	77	33				21	21	3

* See Table 1 for definitions of narcotic stages.

Average feeding time before reaching Stage II was about six minutes at moderate dosages. Some individuals have reached Stage III within three minutes after beginning to feed on heavier dosages. The data on hand are inconclusive and the taste factor presents a problem which must be solved before methoxymol will be of practical value for capturing turkeys, but we are optimistic that the bad taste can be masked and that methoxymol will prove superior to alpha-chloralose in every respect. The drug will be given special attention in next winter's research.

DISCUSSION

Automatic Baiting Devices

Two automatic game feeders (Lehman Equipment Company, Route 3, Box 53, Corpus Christi, Texas 78415) were tested on the turkey study area last winter. The devices hold about 200 pounds of shelled corn which is distributed around the feeder twice each day by a small fan which is timed by a battery-activated clock device. The feeders require infrequent tending and greatly facilitate proper pre-baiting. We plan to use 24 of these feeders next winter for pre-baiting.

Effect of Alpha-Chloralose on Reproduction

Two hens captured with alpha-chloralose for radio-tracking studies produced full clutches of infertile eggs. It was thought that the failure of the eggs to hatch may have been associated with alpha-chloralose anesthesia. The hens were anesthetized within a few days of the time of laying and it is conceivable that the prolonged high body temperature or some other effect of alpha-chloralose anesthesia prevented the fertilization of the eggs in some manner, possibly through destruction of sperm cells in the hen's body.

To test this idea, three penned, domestic turkey hens were permitted to eat pelleted feed which had been treated with alpha-chloralose at a rate of 2 grams per cup. They remained in anesthesia for 24 to 30 hours and thereafter were isolated from gobblers. Fourteen eggs were taken for artificial incubation between four and 16 days after anesthesia. Five hatched and at last report (approximately 40 days old) the poults were healthy. Of twenty eggs taken from the same hens during the 21-day period immediately preceding anesthesia, nine eggs hatched. Eight poults from this hatch were still living about 70 days after hatching. The hens continued to lay a few eggs in the absence of a gobbler after the collection of the first 14. Six of the 15 laid, hatched. The difference in hatching success between eggs taken after drugging (34%, including the last 15) and before (45%) is not great enough to suggest that hatching failure in the two wild nests was caused by alpha-chloralose anesthesia. Egg hatchability normally tapers off after the last mating. This may be partly responsible for the difference in hatching success in the pen experiment before and after anesthesia.

Mortality Rates

Table 3 shows the mortality rates of the three trapping methods used in Florida during last winter's (1965-66) trapping season. Analysis

TABLE 3. COMPARISON OF THREE TRAPPING METHODS, 1965-66.

Method	Gobblers Captured	Hens Captured	Total	Mortality	Percent Mortality
Alpha-chloralose	213	379	592	66	11.5*
Methoxymol	39	44	83	8	9.9**
Cannon net	31	8	39	5	12.9
Totals	283	431	714	79	

* Includes death of 13 turkeys which is probably attributable to chilling rather than overdosage.

** Includes mortality resulting from extremely high experimental dosages.

of the success of several trappers who caught turkeys last winter shows that some consistently experienced less than 5% mortality. This suggests that practice and perhaps individual ability are very important in using alpha-chloralose, as in most everything else. It also suggests that with proper application, mortality rates below 5% can be expected with alpha-chloralose.

Research Suggestions

We plan to give major attention next winter to finding a way to make methoxymol more palatable to turkeys and testing the drug and several barbiturates fully in field trials.

Our suggestions for research on orally administered drug capture methods are in two categories: 1) searching for better drugs and drug combinations, and 2) devices and techniques to improve current capture methods based on alpha-chloralose. We are inclined to stress the latter at this time because experience has shown that turkeys and other species can be captured without significant mortality with alpha-chloralose when the method is conscientiously applied by personnel experienced with the method. We suggest continued, cautious experimentation with alpha-chloralose with diligent effort to solve its drawbacks. In this category, for example, would be experimentation with drug stickers, auxiliary catching nets, diversionary baiting, better baits, crop-washing devices, and similar ideas.

The chances are good of finding "better" drugs than alpha-chloralose for capturing turkeys. We are experimenting with some now which are faster-acting, shorter in duration of narcosis, lower in toxicity, and which decompose reasonably soon upon exposure to the elements, to mention a few desirable qualities.

Even when better drugs than alpha-chloralose are found for catching turkeys, time spent in research and practice with alpha-chloralose will not represent time wasted because the compound will probably never be outmoded for certain situations and experience gained with alpha-chloralose will be useful in converting a trapping operation to similar drugs.

A Final Precaution

Not everyone who wishes should be permitted to use orally administered hypnotics on wildlife, even if they are permitted under state and federal laws to possess such drugs. We should not need to make the comparison between a novice trying to assemble a cannon net to catch turkeys and one stirring up a batch of narcotic bait. Orally administered drug techniques do not have the built-in safeguards against inexperience and ineptness that other methods have. Its careless use could be disastrous in some situations.

SUMMARY

Nearly 1,000 wild turkeys have been captured in Florida with orally administered narcotics during the past two years. About 833 of these were anesthetized with powdered alpha-chloralose applied to baits. The optimum dosage employed was 2 grams of alpha-chloralose per cup of bait.

The proper application of the capture method demands that careful attention be given to preparing for the capture attempt. Careful pre-baiting is especially important. Trial-and-error experimentation with orally administered narcotics in Florida has provided a number of suggestions which can be followed by others who wish to catch wild turkeys with alpha-chloralose.

A faster-acting drug similar to alpha-chloralose, called methoxymol, promises to be better for capturing turkeys. It will be thoroughly field-tested soon.

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TECHNIQUE FOR CAPTURING CANADA GEESE WITH ALPHA-CHLORALOSE ¹

By E. DALE CRIDER and JIMMIE C. MCDANIEL

Florida Game and Fresh Water Fish Commission

Suite 21, 412 N. E. 16th Avenue, Gainesville, Florida 32601

Banding has become an important tool in Canada goose (*Branta canadensis*) research and management. The shortcomings of current capture methods have limited the realization of the full potential of banding as a research and management tool.

Goose trapping in North America began early in this century by

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