Hurd, E. S. 1962. A dinnerbell for the white-tail. Am. Forests. 68(8):24-26, 46-48.

Lay, D. W. 1969. Foods and feeding habits of white-tailed deer. Proc. of white-tailed Deer Symp., March 25-26, Nacogdoches, Texas. In press.

Loveless, C. M. 1964. Some relationships between wintering mule deer and the physical environment. Trans. 29th N. A. Wildl. and Nat. Resource Conf. pp. 415-431.

Marchinton, R. L. 1968. Telemetric study of white-tailed deer movement ecology and ethology in the Southeast. Ph.D. Thesis, Auburn Univ. 138 pp.

Marshall, A. D. and R. W. Whittington. 1968. A telemetric study of deer home ranges and behavior of deer during managed hunts. Proc. 22nd Conf. S. E. Assoc. Game and Fish Comm. Oct. 21-23, Baltimore Maryland. In press.

Michael, E. D. 1965. Movements of white-tailed deer on the Welder Wildlife Refuge. J. Wildl. Mgt. 29(1): 44-52.

Montgomery, G. G. 1963. Nocturnal movements and activity rhythms of white-tailed deer. J. Wildl. Mgt. 27(3): 422-427.

Robinson, C. S. 1935. Truck trails and firebreaks; their use by deer in the Santa Barbara National Forest. J. For. 33(11): 940-942.

Rongstad, O. T. and J. R. Tester. 1969. Movements and habitat use of white-tailed deer in Minnesota. J. Wildl. Mgt. 33(2) 366-379.

Russell, C. P. 1932. Seasonal migration of mule deer. Ecol. Monog., 2: 1-46.

Sanderson, G. C. 1966. The study of mammal movements—A review. J. Wildl. Mgt. 30(1): 215-235.

Severinghaus, C. W. and E. L. Cheatum. 1956. Life and times of the white-tailed deer. pp. 57-186. In W. P. Taylor, The deer of North America. The Stackpole Co., Harrisburg, Pa.

Siglin, R. J. 1965. Movements and capture techniques—a literature review of mule deer. Special Report No. 4, Game Research Div., Dept. of Game, Fish and Parks and Coop Wildl. Research Units. Colorado.

Skiff, J. V., 1947. The white-tail in New York. Part I. New York State Cons. 2(2): 6-7.

Tester, J. R. and K. L. Heezen. 1965. Deer response to a drive census determined by radio-tracking. Bioscience. 15(2): 100-104.

Thomas, J. W., J. G. Teer and E. A. Walker. 1964. Mobility and home range of white-tailed deer on the Edwards Plateau of Texas. J. Wildl. Mgt. 28(3): 463-472.

Townsend, M. T. and M. W. Smith. 1933. The white-tailed deer of the Adirondacks. Roosevelt Wild. Bull. 6(2): 161-325.

Welch, J. M. 1960. Factors influencing movements of white-tailed deer in Southern Arizona. M. S. Thesis. Univ. of Ariz. 79 pp.

CAPTURING SNIPE WITH MIST NETS [1]

By MICHAEL J. FOGARTY

Florida Game and Fresh Water Fish Commission, Wildlife Research Projects, Gainesville, Florida

ABSTRACT

During the winters of 1967-68 and 1968-69, 1,015 common snipe (*Capella gallinago*) were banded on a fresh water marsh in north

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central Florida including 994 which were captured with mist nets. The most productive techniques were driving the birds into nets concentrated in areas of heavy snipe utilization, and intercepting snipe along regular flight lanes.

Net type, mesh size, color, and field techniques are described. Other capture methods are briefly discussed.

References on the general use of mist-nets to capture birds can be found but few describe a netting technique for snipe. McClure (1956) reviewed three methods of arranging nets depending on the habitat (shoreline, hillside, and marsh) to capture various species. Sheldon (1960) discussed the most successful net arrangements, mesh sizes, and hours of operation for mist-netting woodcock during the summer in Maine. Tuck (1965) has used mist nets successfully in capturing snipe but has not described his method of netting snipe in their wintering range in detail.

A snipe banding program supported by the Bureau of Sport Fisheries and Wildlife was initiated in Florida during October 1967, as part of the "Accelerated Research Program" for shore and upland migratory game birds, administered by the Migratory Bird Populations Station. In two winters 1,015 snipe were banded. Of these 994 were captured with mist nets. In view of the new interest in research and management of snipe, a description of the techniques for capturing this species seems warranted.

I would like to express my appreciation to Messrs. James A. Brogdon, Neal F. Eichholz, Robert W. Phillips, and Harvey L. Hill for their assistance in conducting field work. Special thanks are due Dr. Leslie M. Tuck for the helpful suggestions he made during a two-week visit to the study area in February 1968. Mr. John Camp, Ocala, kindly permitted us to use his property for the banding work. Lovett E. Williams, Jr., reviewed this manuscript and offered suggestions during its preparation.

DESCRIPTION OF THE TRAPPING AREA

Trapping was conducted on Paynes Prairie, an oval, shallow basin of about 12,000 acres lying just south of Gainesville, Florida (Fig. 1). The prairie has a firm sandy bottom, covered by a layer of muck, and underlain by porous limestone. Solution has produced sinkholes and underground channels in the area. In the past when the sinkholes were closed, the flooding of the prairie produced a lake.

At present, these sinkholes are kept open to drain the basin for cattle pasture. Seasonal fluctuations in water level are controlled by pumping, and by levee and culvert construction.

Snipe were trapped on about 500 acres near the north central edge of the prairie. The 300 cattle which had access to the area kept the dominant plant species, maiden-cane (*Panicum hemotomon*), grazed to about 6 inches high.

MATERIALS AND METHODS

The mist nets used in this study were purchased from the Bleitz Wildlife Foundation, 5334 Hollywood Blvd., Hollywood California. All mesh sizes are stretched mesh measurements. The colors sand, green, and black, in sizes 1 1/2, 2 3/8, and 4 inch mesh were tried. The 4-inch mesh proved to be the most effective mesh size but color did not influence capture success. The larger nylon threads used in this mesh size reduced the cutting damage to the wings which resulted in the smaller mesh sizes when snared birds struggled to escape. The 4-inch mesh nets caught fewer red-winged blackbirds (*Agelaius phoeniceus*), tree swallows (*Iridoprocne bicolor*), and least sandpipers (*Erolia minutilla*) and other small species of birds which were numerous on the banding area and were frequently snared in the smaller mesh nets. Perhaps the greatest advantage of the 4-inch mesh size nets was the

speed with which snipe can be removed from the nets. To remove a bird alive from a mist-net, it is usually necessary to determine from which side the bird entered the net and remove it feet first, from that side (Low 1957), but the 4-inch mesh allows the operator to remove a snipe head-first from either side of the net.

After removing snipe from the nets, the birds were placed in muslin drawstring bags, 14 inches square. No mortality occurred when 7 or fewer birds were placed in each bag. If the birds were wet, fewer were placed in each bag to facilitate faster drying. Although weak or sick birds were not observed, the bags were washed once a week to reduce the possibility of spreading parasites or diseases.

Upon returning to the central banding station, the snipe were removed from the bags and placed in holding cages measuring 30 inches long, 12 inches wide, and 10 inches high. The cages were made from 1 x 2-inch cedar covered with 1/2 inch hardware cloth. An opening on the top was made by stretching and overlapping two pieces of heavy-duty inner-tube rubber. This self-closing "door" eliminated accidental escape. The interior of the box was lined with a double thickness of burlap to prevent physical injury to the snipe resulting from their attempts to fly within the cages. The bottoms of the cages were unlined so that the droppings could fall through the wire mesh. As many as 25 snipe have been held in one of these cages overnight without any apparent injury to the birds. The cages were believed to be particularly important during cold weather if snipe were wet because they permitted the snipe room to dry and preen before being banded and released.

Driving. After an area of heavy snipe utilization was found, 8-10 nets were erected by suspending them between bamboo poles which were then forced into the marsh. Smooth-walled aluminum electrical conduit poles were tried, but bamboo was favored because the nodes aided in keeping the nets properly suspended. The nets were staggered one behind the other so that the operators could walk towards the nets (Fig. 2). One operator often handled three such sets. The largest set manned in the banding effort consisted of 18 nets.

The nets were spread in the morning to be ready for the first snipe movement. The few birds which were caught in the nets during this interval were left until enough snipe accumulated near the nets to justify a "drive." The most efficient drives resulted when two or three drivers walked about 100 feet apart slowly towards the nets with occasional stops when the flushing snipe began to fly too far and high. This would keep the birds moving away from the drivers in short flights close to the ground. As the snipe landed near the nets, the pace was increased causing the birds to strike the nets as they took flight. Sometimes a fast pace caused the snipe to flush too early and attain sufficient altitude and orientation to go over or dodge the nets.

Too frequent drives caused the snipe to abandon a particular trapping locality. When snipe were at peak numbers, four and five drives a day were made. The last drive of the day was usually made just before dark after which the bander closed the nets. When trapping was planned for the next day, the nets were closed by bringing all the loops at the ends of the shelf-strings together. The loose mesh was then coiled about the taut shelf-strings at four places along the length of the net. If banding was to be suspended for more than a day, the gathered nets were tied with short lengths of twine.

The nets were moved every week during intensive daily trapping operations; otherwise, the snipe became familiar with the set and became more successful in dodging the nets or tended to avoid the area entirely. When trapping less than three days a week, nets could be left in one location for two weeks or more, depending on trapping success.

Snipe showed a marked preference for areas of optimum cover, soil consistency, and moisture. These conditions sometimes changed rapidly

and snipe would then move from one area to another, within two weeks, to areas where feeding was more productive.

Interception. Snipe were evenly distributed throughout the extensive stretches of preferred habitat on Paynes Prairie during winter. Unlike many of the coastal shorebirds, snipe often fly alone or in small groups but by mid-February they demonstrated signs of impending migration by grouping in increasingly larger flocks. At this time, when a group of snipe was deliberately flushed, instead of immediately returning to the ground after a short flight, the birds wheeled around the study area in a wide circle. By March this activity became spontaneous and other snipe would join in this premigratory flight creating large flocks from 50 to 100 birds which would often remain in flight for 5 minutes or more and then abruptly land. Flight lanes were easily detected making capture simply a matter of arranging the nets in stategic locations along these routes.

Intercepting snipe flocks was at times especially effective. Snipe flying in this manner seemed pre-occupied with their activity and were oblivious of the nets, rarely dodging the set. This made frequent relocation of the nets unnecessary. Also, when the snipe were flocked, fewer nets had to be employed for larger catches, and the need for driving the birds was circumvented, thereby reducing the number of field personnel required.

Other Capture Methods. A cloverleaf trap (Tuck 1965) and two versions of a funnel-entrance trap (Mosby 1960) were tried. The cloverleaf trap was constructed with 1/2-inch chicken wire, 30 inches high, supported by 3/8-inch diameter wood dowels. Thirty-foot leads were also made from chicken wire, 18 inches high. Erosion cloth was used to cover the trap.

Two funnel-entrance traps were used. One was a large, land-based version similar to the type used for waterfowl. It measured 8 x 8 x 4 feet and was enclosed with 1/2-inch chicken wire with funnel-entrances on all four sides. The leads extended 30 feet from the mouth of the funnels. Camouflage netting was used to cover the trap.

A small funnel-entrance trap, (Winston 1954) similar to the type used to capture doves (*Zenaidura macroura*), of 1-inch weld-wire was tested. It measured 48 x 48 x 12 inches, had a funnel at each corner and was completely collapsible. Leads of 1/2-inch galvanized chicken wire extended out 15 feet from the mouth of each funnel.

Night-lighting, which has been successfully employed (Glasgow 1958) on woodcock (*Philohela minor*), was tried with snipe on Paynes Prairie and near Fisheating Creek (Palmdale) in southern Florida. The aluminum capture nets made by Ed Cumings, Inc., Flint, Michigan, had telescoping handles extending to 12 feet. A small mesh nylon net was laced to the 18-inch hoop. A General Electric 12-volt automotive lamp (No. 3452) provided the light. Power was supplied by a Yuasa motorcycle battery (No. B101-12) fitted in an Army surplus canvas canteen bag secured to the waist with a surplus pistol belt. This was heavier than a similar dry-cell arrangement but produced a suitable beam for 8 hours.

RESULTS AND DISCUSSION

The results of the two snipe banding seasons are summarized in Table 1. The snipe banded by methods other than mist-netting amounted to 7.1%. The conventional ground traps tested did not prove to be as efficient as mist-nets. Concentrations of snipe moved from place to place, necessitating moving the traps to keep up with snipe. This was unprofitable in view of the few birds these traps captured.

The night-lighting effort of 86 man-hours, resulted in only 23 snipe banded or 0.3 birds/hour. Unlike woodcock, the eyes of snipe do not reflect light (glow) making it difficult to see the bird. An effective way to spot them was by noisily walking across the study area and, upon

flushing a snipe, follow it to the ground with the light. This made the snipe more wary and ready to flush again regardless of how quietly they were approached the second time. As many as 35 snipe per hour were flushed when night-lighting within an area of area of about two acres on Paynes Prairie. If a technique can be developed which would permit the snipe to be seen easily, the method would probably prove to be as productive on snipe as it is with woodcock.

Table 2 compares the mist-netting effort by season. The mist-nets were operated 4 days more in the second year than in the first but the total hours the nets were manned decreased from 0.8 to 1.1 (7.3%) while trapping time decreased by 120 hours.

The mortality rate decreased from 3.6 to 2.0% during the second banding season. The main cause of mortality was drowning. This occurred when two or three snipe struck the middle of the net in the lowest shelf. The weight of the birds would cause the net to bow and when the nets were suspended over water, drowning often occurred if the operator did not quickly retrieve the snipe.

In two banding seasons, avian predators killed 5 snipe which were snared in the nets. Twice red-shouldered hawks (*Buteo lineatus*) were snared when they attempted to remove snipe from the nets. A marsh hawk (*Circus cyaneus*) was seen killing an entangled snipe but the hawk eluded capture.

Mist-netting snipe on Paynes Prairie was more productive than capturing the birds with conventional ground traps. Although 1.1 snipe/hour is a relatively disappointing capture rate, it is worthy to note that during the last four days of trapping during the 1968-69 season, the interception technique was employed entirely. The nets were manned for only 24 hours and 115 snipe were captured. This represents a capture rate of 4.8 birds/hour which is almost 4 1/2 times the average mist-netting rate and 23% of the entire catch.

LITERATURE CITED

Glasgow, L. L. 1958. Contributions to thte knowledge of the American woodcock (*Philohela minor*) (Gmelin), on the wintering range in Louisiana. Unpublished Ph.D. Thesis, Agriculture and Mechanical College of Texas. 159 p.

Low, S. H. 1957. Banding with mist nets. Bird-Banding, 28: 115-128.

McClure, H. E. 1956. Methods of bird netting in Japan applicable to wildlife management problems. Bird-Banding, 27: 67-73.

Mosby, H. S. (Ed.). 1960. Manual of game investigational techniques. Edwards Brothers, Inc., Ann Arbor, Mich.

Sheldon, W. G. 1960. A method of mist-netting woodcock in summer. Bird-Banding, 31: 130-135.

Tuck, L. M. 1965. On the life history of the common snipe, (*Capella gallinago*) (L.). Proc. 22nd Annu. Conf. Northeastern Assoc. Game and Fish Commissioners.

Winston, F. A. 1954. Status, movement and management of the mourning dove in Florida. Fla. Game and Fresh Water ish Comm., Federal Aid Proj. W-22-R., Tech. Bull. No. 2.

TABLE 1. Mortality Rates and Other Data on Captured Snipe

Season	Type Trap	No. Caught	No. Died	Per Cent Died	Other[1]	No. Banded
1967-68						
	Mist-net	482	17[2]	3.6	16	449
	Cloverleaf	13	0	0	0	13
	Funnel-entrance	33	3	9.1	0	30
	Night-lighting	12	1	8.3	0	11
TOTAL		540	21	4.0	16	503
1968-69						
	Mist-net	512	10[3]	2.0	3	499
	Funnel-entrance	1	0	0	0	1
	Night-lighting	12	0	0	0	12
TOTAL		525	10	1.9	3	512

TABLE 2. Comparison of Snipe Mist Netting Results

Season	Total Trapping Days	Snipe per Day	Total Trapping Effort in Man Hours	Snipe per Hour
1967-68	43	10.4	567	0.8
1968-69	47	10.6	447	1.1

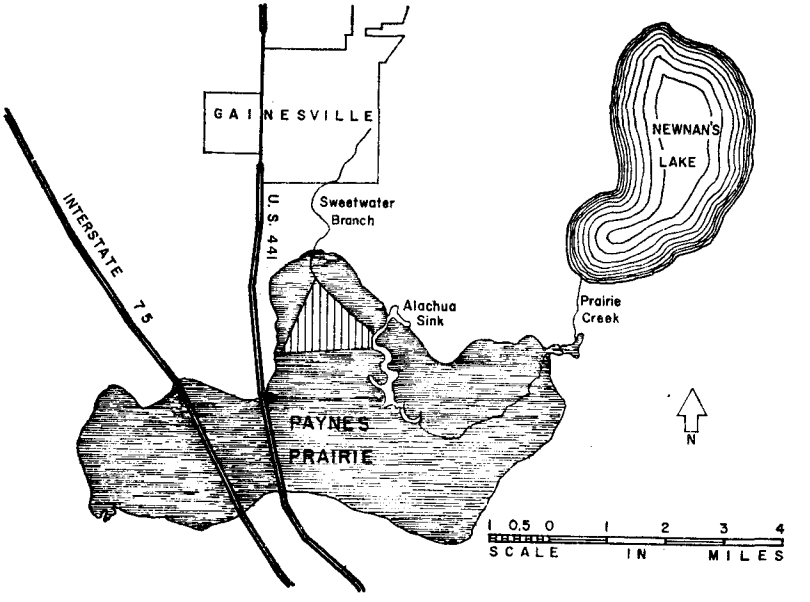

Figure 1. Paynes Prairie showing banding site. --

1 Escaped before being banded.
2 Includes three killed by avian predators.
3 Includes two killed by avian predators.

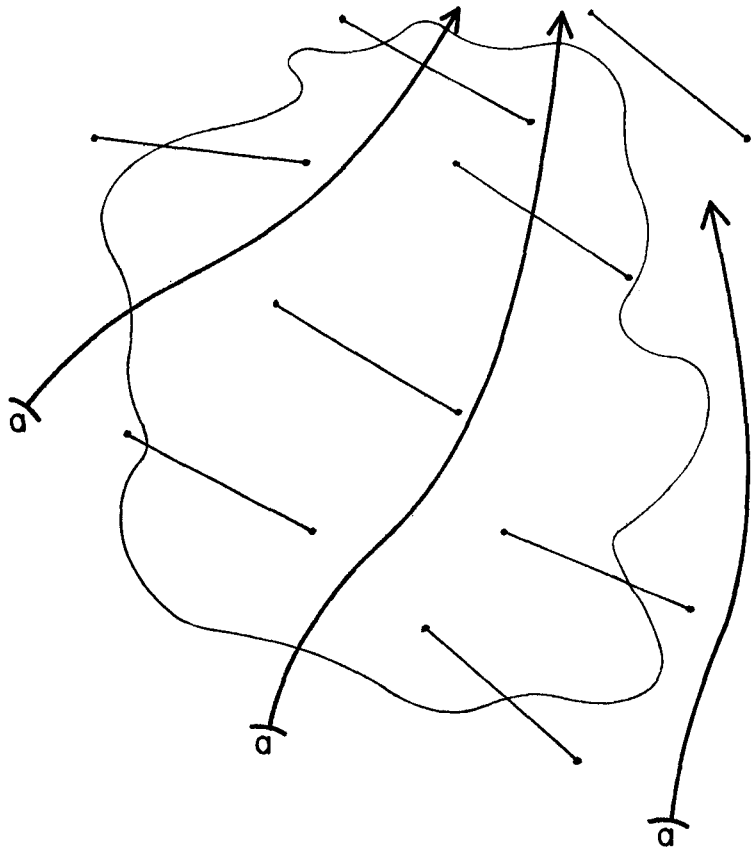

Figure 2. Typical mist net set in an area of snipe concentration showing positions of drivers (a) before drive, drive routes, and mist net positions.

ANALYSIS OF RECORDS OF LOUISIANA-BANDED WOODCOCK

By F. W. MARTIN,[1] S. O. WILLIAMS III,[2] J. D. NEWSOM,[3] and L. L. GLASGOW[4]

INTRODUCTION

From winter 1948-49 to winter 1968-69, 17,176 American woodcock (*Philohela minor*, Gmelin) were banded in Louisiana by staff and students in wildlife management at Louisiana State University, and by personnel in the Louisiana Wild Life and Fisheries Commission.

This paper is an analysis of these banding records, and is a revision of a thesis recently completed by Williams (1969). Objectives were to determine location and time of hunting-season kill, breeding-ground origin of wintering birds, causes of mortality, and annual mortality rates.

The study was financed by the Louisiana Agricultural Experiment Station, and by the Louisiana Cooperative Wildlife Research Unit.

We are indebted to the many persons who participated in banding over the past two decades. E. R. Clark and W. H. Goudy provided IBM cards pertaining to the banding records, and other information. A. D. Geis reviewed the manuscript.

METHODS

Location of Capture

Woodcock have been banded in a number of Louisiana parishes. However, most activity has centered in south-central parishes of Iberville, Pointe Coupee, and St. Landry. Within these parishes, banding has been confined to pastures and croplands used by woodcock at night.

The ratio of timberland to agricultural land varies among parishes where banding was concentrated. However, at least 50 percent of the land area contains bottomland hardwoods, largely cypress-gum-oak swamps. Crops are usually grown on well-drained land, gradually yielding to pastures nearer the swamps. Traditionally, the most important crops have been sugar cane, cotton, and corn. In recent years, however, much cultivated and timbered land has been placed in soybean production.

Capture Technique

Glasgow (1953, 1958) has described the capture technique. The most effective method is with headlamps and hand nets. The ideal light is a hunter's headlamp. The battery is carried in a canvas bag, leaving both hands free to handle the bamboo pole and net.

Two to six workers are best for banding. The workers traverse a field, keeping abreast of each other. When a woodcock's eye is reflected, usually as a reddish glow, the worker quickly but quietly nets the bird. The birds are carried in cloth sacks. When a field has been searched, or when bags are filled, the birds are banded and released.

An ideal night for banding follows a day or two of rain, has an overcast sky, slight mist, and no wind. On such a night, January 2, 1968, six experienced workers captured 391 woodcock in a 6-hour period.

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1 Associate Professor, School of Forestry and Wildlife Management, Louisiana State University at Baton Rouge.

2 Former Graduate Assistant, School of Forestry and Wildlife Management.

3 Leader, Louisiana Cooperative Wildlife Research Unit, School of Forestry and Wildlife Management.

4 Professor, School of Forestry and Wildlife Management (on leave as Assistant Secretary, U. S. Dept. of Interior).