

# BIRD-BANDING

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## BANDING WITH MIST NETS

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The Japanese mist net, introduced to American banders by Dr. Oliver L. Austin, Jr. in 1947, greatly increases the scope of the average bander's activities. Before its introduction banders were limited largely to trapping species that respond readily to bait, particularly to grain and seed mixtures. The mist net allows banders to handle a far wider variety of species and larger numbers of individuals than heretofore, even compared to water-drip traps which have been successfully used by some stations. Highly non-selective, the net catches almost everything that flies into it. It allows the bander to take swallows, flycatchers, vireos, warblers, and thrushes in quantity as easily and safely as he traps seed-eating fringillids and icterids.

Whether at home or afield, mist nets give the bander an operating versatility unobtainable with traps. Nets can be shifted easily and quickly from place to place to make the most of the opportunity of the moment. Yesterday along the multiflora hedge for waxwings, today next to the weed patch where the goldfinches are feeding, tomorrow between the brush piles in the orchard for juncos and sparrows, next week on the marsh for snipe, and later on the dike between the ponds for sandpipers; at Point Pelee, Ontario in May or at Cape May Point, New Jersey in September for migrants galore; amidst the pines in Michigan for the rare Kirtland's or in Pokomoke Swamp in Maryland for the elusive Swainson's Warbler, the mist net is equally useful and efficient in all.

Banders have always obtained more realistic impressions of the numbers of individuals of a species present or passing through an area than have observers, and nets produce a far more accurate and reliable sample than do traps. They often intercept species that pass through completely undetected by the bird-watcher and the trapping bander. At Cape May Point, New Jersey, with more than a thousand bird-watchers combing a relatively small area, we have more than once netted species that were otherwise unobserved. Birders by the score have combed the outer arm of Cape Cod every summer and fall without spotting a Water-Thrush, yet the nets at the Austin Station there take a dozen or so of them regularly every August and September. Since using nets, I have been surprised to find my traps were taking only a portion of the Song Sparrows and Juncos present, and that a number of my returns from prior years for these and other species are retaken only in the nets.

The purpose of this paper, however, is not to extol the potentialities of netting but, on the basis of my own personal experience, to try to advise potential and new netters on the techniques of using them. I was fortunately one of the first to receive some of these nets from Dr. Austin for trial, and I have used them regularly ever since at my banding station on my farm in Maryland. At my station nets do not supplant traps, but they do supplement them and relegate them to a secondary role.

My banding operations are limited mostly to weekends and holidays, and occasionally to brief periods before leaving for the office in the morning and after returning home in the evening. I have a few all-purpose and several Glenhaven trip-door (Potter type) traps. These are always kept baited and are operated frequently from early fall to late spring. Except for sunflower seeds, which are placed in special dispensers, all feed (bait) is placed within the traps. Except when the traps are actually in operation, the birds can enter and leave them at will. Nets are erected only when the station is operating, and are *never* left up unattended.

The role of nets and the extent to which they may successfully supplement or supplant traps at a particular, permanent station depend on too many factors to permit more than a few generalizations. Sufficient space, variety of habitat, climate, exposure to and frequency of winds, and the prevalence of children, dogs, cats, livestock, and predators are just a few of the considerations. In the south nets may be used the year round; in the north cold weather curtails their use during the winter.

When deciding whether or not to use mist nets, suitable sites, prevalence of birds, and available time are secondary considerations. Nor is experience as a trapper any criterion for judging your potential as a netter, though a year or two's experience trapping and banding is essential for a full appreciation of the time involved, of the detail with which records must be kept and submitted, and of the accuracy required in identifying, aging, and sexing the many species of birds handled at a successful banding station.

The most important factor is *your own* ability and adeptness in removing birds from a net. Keen eyesight at close range, a fine sense of touch, deft fingers, and the proper equable temperament are essentials. Before acquiring or trying to use a net, I strongly advise the potential netter to receive first-hand instructions from an experienced netter, and to test his or her own ability and adeptness by actually removing a number of birds from a net.

#### DESCRIPTION

Mist nets are made in Japan of fine silk or nylon thread, dyed black to make them invisible when set against a dark background. The netting, best described as similar in texture and structure to a hairnet, is mounted loosely on a taut frame of strong twine, crossed by horizontal braces called "shelfstrings" of the same twine about 1½ to 2 feet apart. The excess netting hangs in a loose bag or pocket below each of the lower shelfstrings. A bird striking the net falls into this pocket and remains there quietly until removed.

Nets for upland birds are made in two mesh sizes, a smaller one with meshes  $\frac{3}{4}$  inches long (on a side), a larger one  $1\frac{1}{4}$  inches. The smaller mesh, hereinafter called the small bird size, is the more useful for general banding. While some individuals of the smallest species, hummingbirds, wrens, creepers, and kinglets, will slip through occasionally, this mesh will stop and hold most birds up to the size of the Kingfisher, Flicker, and Sparrow Hawk, and sometimes even larger ones. However, considerable wear and tear of the nets must be expected with medium-sized birds, and strong-legged birds such as grackles and jays often damage the netting.

Nets of the larger mesh are often referred to as thrush, snipe, or blackbird nets. Most banders will have little if any use for nets of the  $1\frac{1}{4}$ -inch mesh. The netting is stronger and does not tear as readily as does the small bird mesh, but it is harder on the birds. The threads cut into the flesh more easily. I am not sure whether this is due to the difference in the thread, or the result of a sawing action and leverage the greater spacing of the larger mesh gives the birds.

These "thrush" nets will stop and hold species that normally rip right through the small bird nets, such as ducks, hawks, pheasants, and large herons, but small songbirds will slip through the larger mesh. Though this is an asset to the professional who wants to band only a particular larger species, it is a disadvantage to the amateur bander. Shorebirds, blackbirds, and even larger species are more difficult to remove from these nets than from the small bird nets and, despite their name, I consider them definitely not suitable for thrushes.

Mist nets are made in standard lengths of 10 or 12 meters (they vary from 30 to 38 feet, depending on the manufacturer). Their height, usually from 3 to 7 feet, is determined by the number of shelves, commonly from two to five.<sup>1</sup> The ideal net for general banding is one of four shelves. This has five shelfstrings running lengthwise of the net, one at the top, one at the bottom, the other three spaced equidistant between them. At each end of each horizontal shelfstring is a heavy loop for attaching the net to its supports.

The nets available from various Japanese manufacturers vary considerably in quality. Strength, smoothness, and freedom from knots of the shelfstrings, and resistance to change in length with humidity are features of the better grade of net. The amount of slack in the netting, both vertically and horizontally, is another important consideration, and it is seldom ample in the cheaper nets. The netting should be about 10 percent longer than the stretched shelfstrings; a 30-foot net should have about 33 feet of netting horizontally. When the lateral slack is insufficient, it can be increased by shortening the shelfstrings, which also shortens the net. This is the only adjustment that can be made in the net's structure.

<sup>1</sup>The standard lengths have been found by the Japanese the most convenient size to handle. Shorter or longer nets can be obtained on special order, and they can be made with any number of shelves. Japanese market netters in the highlands sometimes use nets of 15 to 18 shelves, from 25 to 30 feet high. These require elaborate permanent sets with special raising and lowering gear, and are quite expensive.—O. L. A., Jr.

Vertical slack between the shelfstrings, an equally important consideration, can be adjusted by spacing the shelfstrings properly when setting the net. The netting should fall 3 to 4 inches below each shelfstring, except of course the top one. If the pocket thus formed is too shallow, it will hold fewer birds; if it is deeper than necessary over-all height is sacrificed needlessly and the birds will become more entangled and be harder to remove. A four-shelf net of good quality when properly set stands about 6 feet high; when stretched vertically to its utmost, eliminating all vertical slack, it may stand  $1\frac{1}{2}$  to 2 feet higher.

Compared with the cost of traps, mist nets are quite inexpensive. The best four-shelf nets cost from \$2.50 to \$5.00 each, depending on the length. Inferior nets are obtainable for a dollar or two less, but they are just not worth buying from any point of view. They do not wear or last as well and, much more important, they do not take birds as safely or as efficiently as do those of the better grade (see page 127).

While I have not used nets from every available source, I have tried quite a number of the different ones that have been brought into this country. Of these the only ones of top quality, in my experience and opinion, are those imported by Dr. O. L. Austin, Jr., and which are now being distributed exclusively by the Northeastern Bird Banding Association.

#### NET SITE SELECTION

The mist net operates by intercepting birds in flight. Success depends on the bird's failure to see the net in its path until it is too late for it to stop or swerve aside. This situation is best fulfilled by setting the net where the birds will hit it in full flight, and where it is as invisible as possible at a short distance.

The invisibility of a net, assuming it is not in motion, depends on the background behind it. A dark and broken background is much better than a light or uniform one. Woods, thickets, shrubbery, hedges, fields, and fencerows make fine backgrounds; sky, water, snow, beaches, and white buildings are poor ones. Against a good background, which need not be close to the net, the net may be out in the open and in full sunlight. It is a simple matter to step back a few yards and check the visibility of your net.

Nets do not work well if exposed to wind. Even a light breeze will cause motion that reveals the net's presence. Also, unless directly abeam, wind blows the horizontal slack to one end of the net and leaves most of the netting stretched too taut. Thus, except in calm weather, shelter from the wind is an important consideration in site selection.

Various hazards have to be kept in mind. When invisible to birds, the net is equally so to people, livestock, dogs, rabbits, deer, and other animals. Any of these crashing into a net will tear it to pieces. Precautions must be taken to select a site with a minimum of such hazards. Setting the bottom string at least 12 to 18 inches off the ground will let small animals pass under it, but an appreciable percentage of the low-flying birds will do likewise.

With the background, wind, and various hazards all in mind, all that remains is to find a place where birds tend to fly back and forth

fairly low. Woodland borders and edges are far more productive than sites well within woods or out in the middle of a field. Paths along the edges of thickets, gaps in hedges, tree lines, fencerows, and between buildings and shrubbery are excellent. Sites may be created by landscaping and planting, and by cutting gaps and lanes in shrubbery. I find a set between a feeding area and near-by cover usually better than one in the midst of a feeding ground.<sup>2</sup>

At home banding stations the establishment of permanent netting lanes is an excellent practice. When not limited by space, habitat, and other considerations, it pays to have more permanent lanes than the number of nets one can normally handle. Then one has a choice of sites on any particular day according to wind direction, species present, and the locations being favored by the birds. Quick shifts can be made in a matter of minutes as circumstances dictate.

#### PREPARING THE SITE

Whether netting at a permanent home station or at casual locations afield where birds are tending, preparing the site properly before setting the net will prolong the life of your equipment immeasurably. The netting will catch on the slightest obstruction, and removing all possible snags beforehand prevents needless rips and tears.

The usual procedure is to stretch the net between two posts, trees, or other supports, making it fast at each end by the loops at the ends of the shelfstrings. The lane where the net is to hang between its supports must be straight<sup>3</sup> and clear of all vegetation at least 2 feet on each side of the net. This not only allows the operator room to walk on each side of the net, but prevents the net snagging on vegetation when the wind billows it out.

Usually the height of the bottom shelf will determine the over-all height of the net, but the top shelfstring must be no higher than you can reach conveniently. To prevent birds passing under the net, the bottom shelfstring should be within 6 or 8 inches of the ground.<sup>4</sup> When this close to the ground, the ground surface must be clear of litter and snags. The best surface for a net lane floor is bare soil, or else a smoothly mowed strip of lawn grass. If the lane does not have a suitable floor, the bottom strand must be set high enough to keep the netting off the ground when pulled down by the weight of a bird.

When the bottom strand is set close to the ground, two additional considerations must be kept in mind. A bird in the bottom shelf, if able to get its feet on the ground, will spring up again. This leads to double and triple pocketing, which makes the bird much more difficult to remove. A bird in the bottom shelf is also much more vulnerable to predators than one higher up.

<sup>2</sup>I have had considerable success netting in feeding areas. At my banding station in suburban West Hartford I keep my permanent net lanes lightly baited at all times to keep birds frequenting them.—E. A. B.

<sup>3</sup>The lane can be "dog-legged" by standing a smooth pipe or pole at the angle of the lane and bending the net around it.—E. A. B.

<sup>4</sup>The Japanese usually set their nets about 2 feet off the ground. At permanent sets they block this space with rice straw thatching.—O. L. A., Jr.

For net supports both at permanent station sets and for roving use, I have found the 7- or 8-foot steel fence posts with punched-out hook fasteners, either the angle or the channel type, to be most suitable. They are easily transported on the standard auto carrier racks, and easy to drive into the ground with a pipe-type post driver.<sup>5,6</sup>

#### SETTING THE NET

When not in use I keep my nets folded in small individual cloth bags. An alternative is to roll each net into a ball, or to wind it on a cardboard mailing tube or a board. This takes longer, makes the nets bulkier to store and carry, and involves an additional item of equipment, the tube or board.<sup>7</sup>

To keep the shelfstrings taut and yet provide some "give," I insert a heavy elastic band (no. 84)<sup>8</sup> between each shelfstring loop and the post at each end. Thus my supports are roughly 6 inches farther apart than the distance between the ends of the loops. The shelfstrings of top-quality nets stretch or shrink very little, and the rubber bands take care of it. When they change too much, either the posts must be shifted, or adjustment made by adding or subtracting bands. If so troubled, the factory strings may be replaced with good quality black nylon fishline.

Mist nets are interchangeable end for end and top for bottom, so it makes no difference which end or side you start with in setting or

<sup>5</sup>The roving Japanese netter goes afield with a bundle of light bamboo poles 8 to 10 feet long over his shoulder and his nets rolled up in a burlap sack. He sets his two- and three-shelf nets by putting the loops at one end over the first pole and shoving it into the ground; then he unrolls the net, puts the other loops over the second pole and pulls the shelfstrings tight before sinking the second pole firmly to hold them so.

For beach use I have found 8- to 10-foot lengths of 3/4-inch galvanized steel pipe ideal, and have made long (and successful) sets of five nets in series between six poles. I put the poles through the loops before sinking them firmly into the sand. When stretched taut enough, the loops stay in place on the pipe without braces or ties.—O. L. A., Jr.

<sup>6</sup>Where weight and space for transportation are a problem, I carry 4-foot lengths of 1/2-inch steel galvanized thinwall electrical conduit. Two of these, plus a standard conduit connector, make an 8-foot pole, or over 6 feet above ground. The threadless joint is reasonably steady, especially if the end poles in a line are guyed. The poles are too thin to drive, but fit nicely into holes made with a 2-foot steel pin (made by a local blacksmith for about \$1.25), pointed at one end and driven with an ordinary hammer. To hold the net loops each 8-foot pole has 5 holes drilled about 17 inches apart for 3/16-inch bolts 2 or 2 1/2 inches long, inserted so that half projects on each side. I add a 6th at the bottom, 6 inches below the 5th, to give some option in the height of the lowest shelf depending on the roughness of the ground. Regular steel pipe with threaded connectors make much more rigid supports than the conduit, but weigh twice as much. The standard steel fence post, however, remains the best support if space and weight are not problems. Essential clearing tools to carry afield are a machete or small hatchet, a pair of hand pruners, and a small pruning saw for disposing of fallen trees or large branches.—E. A. B.

<sup>7</sup>The small plastic bags now available for icebox storage are ideal for storing and carrying nets.—O. L. A., Jr.

<sup>8</sup>I prefer no. 33, which is the same length and thickness, but is only a quarter as wide: 3 1/2" x 1/32" x 1/8".—E. A. B.

taking down. I mark an outside loop on each end of my nets with a small tag, first to identify the net with its particular permanent site, second to facilitate selecting the top loop from among the five.

Removing the net from the bag, I hang the tagged loop on the top hook of the first post and back off to the second post unrolling the net as I go, taking care to keep it taut enough so it doesn't drag on the ground or billow too far to the side. I place the tagged loop on the other end on a hook at the desired height on the second post and attach the other four loops down the post at the proper intervals. Returning to the first post I attach the remaining loops to match those on the second post. The whole operation seldom takes more than 2 or 3 minutes.

To test whether or not your net is set properly, watch it from one end as the birds strike it. If they bounce off on a quiet day, there isn't enough slack in the netting. Remedy the horizontal slack by shortening the shelfstrings as described above. Insufficient vertical slack can be remedied by moving the shelfstrings closer together. Do not expect the nets to work well in any wind except possibly a light breeze directly abeam.

When taking a net down, first clean all twigs, leaves, feathers and insects out of the netting. Then place all the loops together on one hook on post #1. Walk to post #2 and lift the loops off the hooks, working from the bottom up, and hold them in one hand. Now walk back toward post #1, folding the net back and forth between your outstretched hands, and keep it taut so it does not billow to one side or drag on the ground. End the folding operation so that one set of loops is held in each hand. Hold one hand high and let go with the other so the net hangs in folds from the high hand. Now roll up the folded net and insert it in its bag. One set of loops with tag will be rolled inside the net, the other exposed on top for ready identification when resetting. The whole operation should take even less time than setting.

Instead of taking the net down, it may be made inoperative by placing all the loops together at the top of each post. If the net so furled is to be left more than an hour or so, it is advisable to make ties around the netting about a yard apart. This prevents the loose net from billowing and minimizes the chance of a bird being caught in the furled net.

#### REMOVING BIRDS FROM THE NET

This is the crucial phase of netting. It is strictly up to the bander himself. There are no special tools or gadgets that can be used to compensate for one's own lack of competence. The only mechanical aid occasionally needed is a pencil or some similar dull-pointed instrument. Keen eyesight, a good sense of touch, and dexterous fingers are essential; patience, perseverance, and perception valuable assets.

Removing a bird from a mist net is normally a one-man proposition. Under most circumstances one person can remove a bird more expeditiously and successfully than can two people trying to work together.

Visitors and other banders present should remember this and keep their hands off the bird and net except as specifically called upon by the person removing the bird.

One can be neither too fast and too rough, nor too slow and too painstaking. Both can be harmful to the bird, and its welfare is the prime consideration. Proficiency can be obtained only through practice and experience. When proficient, one will find that he can remove birds after dark by feel without a light—but a light is most helpful, so pamper yourself and the bird, and make it as easy as possible.

For what might be termed a simple and normal catch, the standard procedure for removing a bird is as follows:

1. Ascertain from which side the bird flew into the net, and work from that side.
2. Find the opening of the pocket, and make sure you have a clear passage to the base of the legs at the bird's abdomen with no netting intervening.
3. Reach into the pocket and grasp the bird by the legs close to the body between two fingers of one hand.
4. Lift the bird up by the legs and out your side of the net as far as the slack permits. Hold the bird out away from the net so that the netting exerts a slight strain. This helps peel and pull the netting away from the bird and, incidentally, keeps the bird from grasping the netting again with its toes.
5. With your free hand peel and push the netting down the legs and off over the toes. Continue to hold the bird by the legs, keeping the feet toward you and away from the net.
6. Now free the tail and work the netting forward up the body to the wings.
7. Work from the under (inner) side of one wing and ease the loops of netting over the bend of the wing (this is where a pencil sometimes helps). Free the other wing in the same manner.
8. When the wings are free, shift your grasp to hold the wings from flapping, keeping the legs safely in your palm at the same time.
9. Free the head last, working a layer at a time from the neck over the head.

Circumstances dictate variations in the above procedure. One of the most frequent is to free the head after freeing one wing and before freeing the other. Once in a while, the head may be freed before either wing. Rarely does one free a leg last, and such cases usually involve a leg with a band already on it.

In cases of double-pocketing, it is often necessary to start on the opposite side of the net to free the folds encompassing the original pocket. When the original pocket swings free of the adjacent netting, you hope the bird will remain quiet until you can get around the other side and reach in to grasp its legs. If the bird flutters, it may complicate matters so you have to start all over again. If the bird is near one end of the net, or at the top or bottom, it is best to hold the bird in the original pocket away from the net with one hand and reach around, over, or under and secure its legs with the other hand. If successful you can usually pull the bird to your side for removal.



When a bird is very badly tangled and no progress is being made in clearing it, the netter must be prepared mentally and equipped with a sharp knife or a small pair of scissors to snip enough strands of the netting to free the bird (be sure no pieces of mesh are left on the bird).

#### NOTES ON OPERATING WITH NETS

When tendings nets, the operator soon learns the desirability of wearing clothes with few, if any, exposed buttons. Buttons, especially on cuffs, readily become fouled in the meshes. Wrist watches, tie clasps, zipper tabs, pens and pencils in outside pocket, and similar items will snag and tear the netting very easily, and are time-consuming nuisances to unsnarl. The safest outer garment for a netter to wear is a long-sleeved, buttonless, pullover sweater.

*Number of nets.* The number of nets a bander can operate safely by himself depends on a number of considerations, but primarily on the number of birds to be handled and his speed in handling them. When the weather is favorable and a normal number of birds are present, I generally operate from 6 to 10 nets on my farm. When I have more than one or two nets up I plan on doing nothing but devoting my full time and attention to them. Under normal conditions any competent and experienced netter should have no trouble handling 4 to 6 nets at his home station if the sets are not too far apart. A continuous line of nets may be tended much more readily than the same number of nets scattered about in several sets far apart.

The netter must exercise good judgment and self-restraint to avoid setting more nets than he can handle properly. With traps, catching more birds than can be handled in the time available is no problem—one simply opens the traps and lets the birds fly away. With nets each and every bird must be extracted and released individually, one by one. You cannot dash off to an appointment leaving a net set and unattended. Start taking down the nets well in advance of any deadline. During the last few minutes a net may catch more birds than you can remove in an hour, and when you are most in a hurry is when you always get the worst tangles to unsnarl!

If you find yourself overexpanded and pressed for time, the best procedure is to take each net down or furl it as soon as it is cleared of birds. If you leave net #1 up while you proceed to clear #2, net #1 may fill up again in the meantime. A net with 20 or 30 birds in it will take relatively few additional birds, as the weight of the birds pulls the netting so taut other birds striking it bounce off. Leave such a net until last and get the others down first.

*Holding cages.* When the netting is good and you are taking birds in quantity, holding cages are a great help. Without them you have to band and process each bird as you remove it from the net, which delays your removing those still entangled. With holding cages you can clear the net in a hurry and then process your catch at leisure in orderly fashion while waiting for the net to fill up again. When overexpanded or pressed for time, ample holding cages are a *must*. Slip the birds into the cages as fast as you remove them from the net and postpone the banding and recording until later.

Birds may be held safely for several hours in a covered cage that is dark inside. It is well to have enough units so you can separate those species that fight when confined with other birds—grackles, jays, chickadees, woodpeckers, and nuthatches, for example. For this purpose the multicell holding cages developed by Parker Reed for grosbeaks and winter finches are especially useful. (These and Mr. Reed's excellent traps are sold exclusively by the Massachusetts Audubon Society.)

I use holding cages to hold until the following morning all birds removed from a net or trap after dark, except night-flying species. Also if a bird is wet, I hold it until it has dried out thoroughly before releasing it.

*Surveillance.* Whereas a trap may be left unattended for as much as 3 hours, nets must be kept under close surveillance. Under favorable conditions at a regular station, intervals of up to but not exceeding an hour between visits to a net are reasonable. If he leaves the nets any longer without checking them or leaves the immediate vicinity, the operator is risking trouble.

Weather restricts netting far more than it does trapping. A bird in a net will succumb more readily to exposure, especially to cold and rain, than a bird in a trap. When a bird is held in an unnatural position in a net rain quickly penetrates through the feathers to the skin. It is difficult to extract a soaked bird from a wet net without unintentionally plucking it at the same time.<sup>9</sup> Thus the netter must avoid letting a shower catch him with birds in the nets.

Unless his nets are set in well-sheltered spots, the netter must keep a close eye on the wind. When it rises to "strong," he must clear the nets quickly of birds, giving first attention to those in the upwind part of the net. As the wind blows the slack to the lee end of the net, it exerts a strangling pressure on the neck of any bird whose head is caught in the upwind portion.

In case of either wind or rain, the bander should concentrate on removing all the birds before furling or taking down the nets. A wet or blowing net will take few, if any, additional birds.

*Leaving nets set overnight.* When birds are migrating during periods of settled weather it is often advantageous, and quite feasible, to leave nets set all night. So doing allows the netter to take fullest advantage of the early morning period when the birds are most active and there is likely to be the least wind. Also dawn and dusk are the most likely times for catching goatsuckers and small owls.

One's first assumption would be that, especially during migration, birds would fly into the net during the night. Such has not proved to be the case. At my station over the past few years I have frequently left nets up all night at various seasons, and they have never taken a bird between total darkness and dawn.<sup>10</sup> At Cape May Point, New Jersey, during the height of the fall migration, we set a line of 18 nets during the late afternoon when the area was virtually devoid of birds. A marked migration came in during the night. The first check of the

<sup>9</sup>In handling wet birds, either netted or trapped, I find it speeds drying and apparently makes them more comfortable to sop the moisture off them with an absorbent tissue such as Kleenex.—E. A. B.

nets at dawn didn't produce a single bird, but a few minutes after sunrise we had some 300. On another occasion the same area was swarming with migrants that moved on at night while the nets were set. Again the nets contained not a single bird at dawn. Thus neither arriving nor departing passerine migrants seem to run afoul of nets after dark.

The foregoing observations, however, apply only to dry, upland habitats. Sets made on beaches, in swamps or marshes, and over or next to water are extremely likely to take birds during darkness and must be tended continually through the night.<sup>11</sup>

When nets are left up overnight at an upland station, they *must* be checked thoroughly with a flashlight after it is actually dark. Some birds, notably thrushes and White-throated Sparrows, go to roost quite late and get caught just at dusk. A headlamp type of flashlight is the best for the netter, as it leaves both his hands free and permits him to direct the light wherever he is looking.

It is not wise to leave a net set overnight close to roosting cover if there is a possibility that the birds might be disturbed and flushed during the night. For example, turning on an outside light or slamming a door will often flush birds from nearby shrubbery.

The presence of deer and the prevalence of night-flying insects or falling leaves are good reasons for not leaving nets up at night. If large owls are common in the vicinity it is also inadvisable. The small bird nets will take Screech and Saw-whet Owls, but will seldom stop and hold Barn, Barred, or Great-Horned Owls. Also the weather expected during the night and next morning is an important consideration. Rain, fog, and even a heavy dew will form droplets on the netting and make it conspicuous.

When leaving a net up overnight, I raise the lowest string high enough to give rabbits, opossums, cats, and other night prowlers room to pass under the netting. On the dawn round I return the bottom string to its proper position, redistribute the slack in the netting, shake out the leaves and water droplets, and kill the flying beetles with the banding pliers. I postpone dissecting and removing the beetles until both they and the net have had a chance to dry out.

*The bird in the net.* Mist nets do not hold all species with equal success, for no two species react identically when they hit the net and find themselves caught. Most small birds, in my experience, tend to lie quietly without struggling once they are down in the pocket—but there are exceptions. Warblers and vireos are among the easiest to take; they lie quietly, seldom tangle themselves badly, and can usually be removed in a few seconds. Among the worst at my station are the Chickadees,

<sup>10</sup>Confirmed by 27 years of netting, first with Italian, then with Japanese nets at the Austin Station. We always leave the nets up overnight in good weather, and have never had a casualty thereby.—O. L. A., Jr.

<sup>11</sup>Night netting can be extremely productive in such habitats when the birds are flying. The nets are so invisible in the darkness they can be set right out in the open against sky or water backgrounds. I have caught quantities of migrating shorebirds in thrush nets at night on the open Cape Cod beaches. On dark, moonless nights the Japanese net ducks over open marshes with much heavier, single-shelf nets of 2½-inch mesh.—O. L. A., Jr.

Titmice, and Cardinals.<sup>12</sup> They flutter and fight the net continually, gather fold after fold of netting in their claws, and tangle themselves badly. The sooner such birds are taken out after hitting the net, the better; the longer they are left in the net, the more difficult they are to remove without injury. Providing quantities of sunflower seed at points away from the net reduces the catches of these species.

In small bird nets, some of the larger birds, particularly the Brown Thrasher and Mourning Dove, tend to lie in the pocket on their backs without becoming enmeshed and often flip themselves along the fold of the netting and escape out of the end. This difficulty is also experienced with shorebirds and other species that do not grasp the netting with their feet. Meadowlarks, Coots, and most Rails frequently clamber out of the pocket and escape. Under normal operating conditions the operator should remove these species first before working on the well-caught birds.

With nets the percentage of repeats is far lower than with baited traps. Nets do not encourage migrants to stop and linger in the vicinity. Resident birds around a netting station soon learn where the regular net sites are and avoid them. I often see my resident Cardinals fly up and over or around my net lanes even when the nets are not strung.

#### CASUALTIES IN NETS VERSUS TRAPS

In evaluating devices for capturing birds for banding, two considerations are of utmost importance, safety and efficiency. The device must not only take birds efficiently in quantity and variety, it is even more important that it allow the bander to capture, hold, and release the birds in as good condition as they were just prior to capture.

I have never seen nor heard of a trap that was 100 percent safe or 100 percent efficient. Well constructed, individual-cell, trip-door traps are reasonably safe, but far from efficient (except for winter finches, such as the Evening Grosbeak). Large traps, such as the all-purpose and house-trap types, are more efficient but less safe. More important than the type and design of the trap are the quality of the materials and the workmanship in its construction. These may increase the cost of traps of identical size and design as much as \$20 to \$50. Not all banders can afford the quality of trap built by such a superior craftsman as Parker Reed!

Even with top-quality traps, some injuries are unavoidable and occasional casualties have to be expected. A bird hopping into a treadle trap may drop the door on another bird just on the threshold. In a cell by itself a bird may bloody its forehead, blunt its bill, hit its head and suffer a concussion, pull off a toenail, or break its leg. When two birds are confined together, one may injure or kill the other.

In a cell by itself in a trip-door trap, a bird is relatively safe from external hazards, providing the trap is inaccessible to predators and cannot be crushed or upset. However, it is impossible to prevent shrikes, small hawks, weasels, chipmunks, and other predators from

<sup>12</sup>On Cape Cod our worst problems are Chickadees, Brown Creepers, and Rose-breasted Grosbeaks.—O. L. A., Jr.

entering maze and funnel-entrance traps. Often they can leave again with their victims, sometimes without the bander being aware of it.

By keeping constant close watch on his traps and removing each bird the moment it is caught, the bander can reduce his casualties from a reasonable 1.0 percent or less to virtually none, but his efficiency will drop 50 percent or more thereby. So slight a gain in safety hardly seems to justify the large loss in efficiency.

With nets, as with traps, some casualties are bound to occur, but the casualty rate in properly operated nets should be no higher than with traps. I have caught tens of thousands of birds with nets, and even more with traps. While I have kept no accurate record of casualties, I am confident that my casualty rate for either nets or traps or both has never exceeded 1 percent of the total take, and is normally only a fraction of that.<sup>13</sup>

Casualties and injuries are attributable either to the equipment or to the operator. With traps, reasonably operated under normal conditions, more casualties can usually be attributed to the trap than to the operator. With nets most of the casualties are chargeable to the operator rather than to the net itself. In my fairly extensive experience, a bird is less likely to kill or injure itself in a net than in a trap, and my losses to predators with nets runs considerably lower than with traps.

Net casualties are higher in nets of poor quality and in nets poorly or improperly set. With a net of good quality properly set, almost all the catches are "clean," by which I mean the bird creates a full pocket and lies in it instead of hanging fluttering from the meshes by a leg, a wing, or its head. A good set cannot be made with a poor net, but a good net can be set badly. With a poor net or a badly set good net, many birds bounce off without being caught, and a substantial portion of those caught are not caught cleanly.

Recently several banders have published criticisms of netting (Brewer *et al.*). I doubt that these critics have had adequate experience themselves with good nets, and strongly suspect they were moved to complain by observing netters who were inexperienced and perhaps in some cases those using poor nets. Such criticisms are not an indictment of netting, but of the individual operators concerned.

#### PUBLIC RELATIONS

Banding in an area accessible to and frequented by the public, unless very close watch is kept on equipment, invites interference with, damage to, and possible theft of traps and nets. The success of any banding site is usually in inverse proportion to the amount of human activity in the immediate vicinity. When not disturbed, birds in nets or traps usually remain relatively quiet. The more they are disturbed before removal, the harder they will struggle to escape, consequently increasing the risk of injury or exhaustion.

Good public relations for banding make it inadvisable to set either

<sup>13</sup>We have always kept records of our trapping and netting casualties at the Austin Station. Our casualties over the years from all causes, including predation, have averaged 0.5 percent of the total number of birds handled, and are almost equally divided percentagewise between birds in nets and those in traps.—O. L. A., Jr.

nets or traps where they are likely to be observed by the general public, particularly if the operator has no control over when and by whom they are seen and lacks the opportunity to explain to each casual observer just what is going on. Examples are sets near and in view of people walking along a sidewalk, driving by on a road, or commuting past in a train.

Poor judgment in when, where, and how banding operations are carried on can do irreparable harm. Uninformed or misinformed spectators may spread exaggerated rumors and make needless complaints to game wardens, the police, and other authorities. Such bad publicity hurts not only the individual bander, but the program as a whole.

The use of nets and traps, however, is no "hush-hush" operation. Every operator of a banding station, whether using nets or traps, should make a special point of contacting and briefing his neighbors on his activities, and also such regular visitors to his premises as the postman, deliverymen, meter reader, and garbage collector.

Banders should welcome individuals and small groups to their stations and make the most of such opportunities to inform the visitors on how and why we band and to enlist cooperation in reporting band recoveries. There is no good reason why visitors should not be shown birds in nets and traps properly set, operated, and tended, and allowed to watch a competent and experienced bander remove and band the birds.

Nevertheless the operator of a banding station, particularly one using nets, will learn quickly from experience that it is inadvisable to admit visitors unless he can supervise them closely. When large numbers of visitors are involved, it is best to exclude them from the actual trapping area and to bring the birds out in gathering cages to an assembly point for the visitors to see. An outstandingly successful example of how to handle such relations with the public is the banding station run by Dr. and Mrs. Paul H. Fluck at Washington Crossing State Park, Pennsylvania.

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