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MIGRATION SAMPLING BY TRAPPING: A BRIEF REVIEW

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INTRODUCTION

While some ornithological problems are visualized before adequate techniques for their study are available, it is also not uncommon for a new technique to lack a worthy problem. Will the technique shorten the time needed to solve existing problems, or will it solve problems beyond the scope of older techniques, or is it merely a novelty, an end in itself rather than a means? While bird-banding in general has always been in some danger of being treated as an end in itself, the danger is particularly manifest in the use of Japanese mist nets. Great interest is developing in the use of these nets to capture passerines in coastwise migration, particularly in fall.

This paper will discuss possible results of such netting, summarizing the work of others. The examples given are illustrative rather than exhaustive, and priority of theories or discoveries is not necessarily implied. To place the use of nets in proper perspective, it will be necessary to review briefly other methods of migration sampling, and various ways of trapping birds.

SAMPLING METHODS OTHER THAN TRAPPING

Sight observation is of course the most widespread and flexible of all sampling methods. Modern binoculars and telescopes, combined with the precise knowledge of field marks pioneered in the United States by Ludlow Griscom and Charles Urner, make a high degree of accuracy possible, and indeed this degree is achieved by a substantial number of observers. As it is carried on in the New England area now, sight observation involves chiefly the pursuit of rarities, and our paper is not primarily concerned with this sort of qualitative sampling. Sight observations of rarities must be used with caution, for reasons discussed in Griscom and Snyder (1955) and Van Tyne (1956).

Of far greater biological significance (and affording equally enjoyable days in the field) is quantitative sampling, which does not depend on the precise identification of single rarities, but measures, for example, fluctuations or trends in the numbers of a species, or differences in the time of migration by age or sex or geographical race.

The skill developed by many observers in the search for rarities makes it easy for them to acquire the specialized skill of consistent estimates of the numbers of birds in flocks, and such estimates complement data derived from trapping or netting.

Telescope observation of nocturnal migrants crossing the moon, using Lowery's (1951) techniques, is filling a gap in our knowledge, even though the number of observers who have conducted long watches is relatively limited. In theory, it is possible to see birds no matter how high they are flying; in practice, small passerines are hard to see at great heights. While most movement is at less than 1000 feet above the ground, there are many exceptions, such as Chaffinches and Starlings noted by Van Dobben (1953). Telescope observation requires a firm platform for the observer, and a minimum of cloud cover; during a substantial, though predictable, part of the month, it cannot be carried on at all, or at lower efficiency. One great advantage is that observation is not dependent on the bird coming to the ground; one great drawback is the impossibility of making specific identifications in any but a handful of cases.

Airport ceilometers have been shown to take a substantial toll of passerine migrants, apparently from collisions in mid-air while dazzled by the beam, on a very limited number of nights with poor visibility (Howell et al., 1954). Birds killed at ceilometers can be picked up and studied at leisure, but the number of ceilometers is relatively limited, and the nights of appreciable mortality cannot be predicted much in advance. If present plans materialize, this mortality will be reduced sharply by screens or shutters, or by turning the light off when birds are seen to be falling to the ground.

Obstructions such as high buildings have long been known to take a toll of migrants, apparently in the same sort of weather that induces mortality at ceilometers. Here again the birds are available for study. High television towers are another source of migrant samples, as discussed by Harrison Tordoff and Robert Mengel at the 1955 A.O.U. meeting (the paper is being published by the University of Kansas Museum).

Mathematical guesses on the nature of a migratory movement, based on a relatively small sample of birds picked up at ceilometers, TV transmission towers or high buildings, or observed crossing the moon, or trapped alive, depend on assumptions as to a number of variables, most of which are hard to record accurately. Estimates of total numbers of birds moving on a given night are especially dependent on such assumptions.

The sample of birds in nocturnal migration may or may not be random, depending on whether, for example, any species migrating at that time customarily migrates too high to be affected by an obstruction, channeling of migration by topography, weather, temperature gradients, wind, city lights, response to dazzling lights, etc. The value of conclusions drawn from the sample depends on how carefully such factors are weighed.

TRAPPING METHODS

Methods of trapping passerines for banding fall into two general classes — wire traps or nets. While the number of designs is large, and while some designs are suited to more than one use, the wire traps can be further subdivided:

(a) Heligoland traps: essentially a large house trap, made of wire netting over a sturdy frame, with wings into which birds move along natural routes, or into which they are driven by a line of beaters. Such traps are the mainstay of most of the coastal bird observatories in Europe, capturing a wide variety of birds (see Brownlow, 1952).

(b) "winter finch" traps: the many stations, particularly in the northern part of the United States and in Canada, which band species like the Purple Finch and Evening Grosbeak in numbers, are evolving a rather specialized trap—starting with a design like the Potter—which has several separate compartments (to minimize fighting), is designed for use off the ground, and reduces wastage of sunflower seeds. (The traps referred to are all in wide use, but we lack generally available descriptions; current efforts to revise the Banding Manual will remedy this in time.) Such banding is ideal for many back-yard stations, as the percentage of returns and recoveries is good and even an inexperienced bander can help to build up the picture of movements of the species.

(c) water traps: in particular, designs like the Brenckle specifically for this purpose. These have long been the usual way to capture insectivorous species, and many fruit-eaters, though requiring more labor to build and operate than traps using grain for bait. Daily operation of a line of water traps can chart the migration peaks of groups like the wood warblers (Mason, 1942). However, the advantages of mist nets have tended to make water traps obsolete, except for a few special situations.

(d) traps using seeds or grain for bait, for example, the Mason trap. The average station will take birds in greater numbers with these traps than with any other group, unless "winter finches" are a station specialty. It is this group that competes most closely with mist nets, and their relative merits will be discussed below. This group is also the most appropriate as all-purpose traps, using grain, fruit and water as attractions.

Nets fall into two main groups:

(a) a miscellaneous group of manipulated nets, including clap and drag nets, not used very widely and mostly for larger birds (see, for example, Hollom, 1950).

(b) stationary nets, with which we are primarily concerned, divided into:

   (1) Italian: a fine mesh between two heavy outer meshes with diamond-shaped holes. They are used in various parts of Europe, but very little on this side of the Atlantic. The

O. L. Austin Ornithological Research Station at North Eastham, Mass., has experimented with them for years, but concluded they were inferior to the Japanese mist nets. While more durable, and less affected by wind, the Italian net takes longer to put up, requires heavier supports, is more readily seen by the birds, and has a smaller catch.

(2) Japanese mist nets: a single fine mesh, supported by horizontal trammels, almost invisible except in direct sunlight. Many of those imported have been of poor quality, especially in lack of proper vertical slack.

The use of mist nets has increased markedly in North America in the past two or three years, and the increase is likely to continue. They have made water traps obsolete except for special situations, and at many stations have relegated traps using grain bait to an auxiliary position. They do not compete with "winter finch" traps, and in fact complement them by taking species like the Purple Finch at seasons when they are present in small numbers and not attracted by sunflower seeds. We do not know of any full-scale Heligoland traps in use on this side of the Atlantic, and it is unlikely that any will be built as an alternative to mist nets.

Requirements for Use of Nets

The successful use of mist nets depends on a number of conditions, which prevent their use at many banding stations but can scarcely be considered drawbacks at others:

(1) since nets capture such a wide variety of species, the bander has to be familiar with all passerines regular in his region, not just species which are attracted to feeders.

(2) nets should not be placed where they can be seen at close range by the general public, and it is desirable to keep them out of direct view of deliverymen or neighbors. Perhaps it is unnecessary to mention that they cannot be placed across the direct route of children, large dogs, or cows. Many suburban lots are not suitable for these reasons, though some lots can be made suitable quite easily by plantings of quick-growing shrubs and trees. Most lots need such plantings anyway if they are to be attractive to birds.

(3) the art of extricating birds takes some practice, and banders undoubtedly vary in their aptitude for it. It demands good eyesight, steady nerves, and patience.

(4) nets should not be used when the air temperature is much below freezing, as they often disarrange the bird's feathers temporarily, and make it vulnerable to cold. The bander cannot wear any sort of gloves while extricating birds.

(5) nets should not be used in the rain, because of the exposure to birds in the net. Also, a wet mesh becomes much harder to work with.

(6) nets require either some cover or a background if they are to take birds — trees, brush, tall weeds, etc. We know of no success with nets on a completely open, bare area except at night, and then mostly for shorebirds.

(7) nets must be watched more closely than traps, and sudden rushes of birds put more pressure on the bander to work rapidly. If it is not feasible to have extra help for the peak hours or days, one good answer is the use of multi-cell gathering cages (of the sort devised by Mr. Parker Reed for quarrelsome species like the Evening Grosbeak), to speed the extraction of birds from the net and to permit the holding of those of greatest interest (from the viewpoint of whatever problems the station is working on) for more leisurely examination after the peak hour has passed. On a good netting day the bander has to be more active than in handling traps, and while the work is not physically strenuous in itself, there is more nervous strain than with traps.

ADVANTAGES OF NETS

For the bander who can meet these conditions, nets have major advantages:

(1) they are by far the most portable of all trapping devices, as the minimum equipment can be carried in coat pockets or a small knapsack. Unlike traps, no preliminary baiting is required (although at a permanent station, it is useful in concentrating birds near the net-lanes).

(2) nets take a greater variety of birds than even water traps, and thus provide the most accurate sample of the passerines present. About the only situation where a water trap *may* have an edge is in capturing birds under a mulberry tree, or similar attraction, if the tree is too high for easy netting. More experiments are needed in combining a water drip with nets, near such a tree. It ought to be possible to form a hollow triangle or square around such a drip, using two or more nets and bending them if necessary (see Bergstrom, 1956a).

(3) Some species are readily trapped at some seasons and not others; for example, wintering Slate-colored Juncos often avoid traps except in snowy weather. However, even at seasons when the species is taken freely by traps, nets will take a far greater number of individuals, partly because they virtually eliminate differences in the inclination of individual birds to enter traps. It is very hard to demonstrate the greater efficiency of nets, since when both are operated at once at the same station, the nets intercept many birds before they can reach traps, and the method of baiting for nets (broadcast, along net-lanes) reduces the attractiveness of bait in traps. Comparisons between different stations in the same season, or the same station in successive seasons, involve other major variables.

Nevertheless, at the senior author's station, the nets take 2/3 to

3/4 of all individuals of seed-eating species, during the spring and fall migrations when both traps and nets are in use, and we believe the nets are two to four times as effective as the traps in capturing such species, quite apart from their effectiveness in taking species that the traps will not. Mr. Seth H. Low feels that the same difference holds true at his farm in Maryland.

POSSIBLE RESULTS OF MIGRATION SAMPLING BY MIST NETS

ARE RECOVERIES TO BE EXPECTED?

Most netting at temporary fall stations along the Atlantic coast has been aimed largely at possible recovery records, with the hope that as more such stations were set up, a worthwhile number of recoveries might be made by stations to the south of the place of banding. While it is true that a chain of such stations affords the best chance of immediate recoveries, the odds against them are astronomical. They can be illustrated by the Black-poll Warbler, which at least up to five years ago had produced not one return or recovery record out of 4200 banded, or the White-throated Sparrow, of which some stations have banded up to 20,000 in migration without a single return (though with a thin trickle of reports from birds that had apparently reached their wintering grounds). The number of birds of any species banded as migrants and definitely on migration when recovered is very small, apart from some like the Evening Grosbeak which do not follow the most usual migration pattern.

We know that a number of passerines migrate 300 to 400 miles in a night, and then rest for from three to five days before the next stage (Southern, 1938a, 1938b, 1939; Stresemann, 1944, 1947, 1948; Wolfson, 1954a, 1954b). This deduction is based on certain European species where the wintering grounds of a specific breeding population, the time of the start of the spring migration, and the time of arrival on the breeding grounds are quite accurately known. We need to establish the length of the migratory stages for each species rather than relying too much on analogy, and it would be desirable to obtain as much direct evidence as possible.

The chance of a migrant alighting at the place of banding on the next migration is very small, even if the bird is still alive and follows the same route, barring species that require highly specialized feeding or resting areas (Blake, 1951). It seems reasonable to suppose that the odds against a banded migrant alighting at any given banding station farther along its route, immediately after banding, is even smaller, and it is unlikely that enough banding stations can be added to shorten the odds significantly. Thus, in a series of stations about 100 miles apart on the same migration route, a species which moves 300 to 400 miles in each stage of its migration will bypass the nearer stations entirely, and it has long been considered doubtful that an appreciable number of recaptures could be made at distances of 400 miles or so.

It is our belief that projects for the netting of passerines in fall should be aimed at results other than recoveries (if an occasional recovery does come to light, so much the better). The use of trapped migrants to produce a wide range of data has been carried to a high degree of proficiency at British observatories such as Fair Isle, illustrated by Kenneth Williamson's many papers, specifically or implicitly showing some of the advantages of "field taxonomy" over "museum taxonomy" (most explicitly, Williamson, 1950). Most of these advantages will be dealt with later in this paper.

THE GATHERING OF DATA

Once a bird is in the hand, what data may be gathered beyond the bare minimum of the banding record? The answer depends on the species and the bander and what problems the bander may visualize. It is obviously impractical for the bander to spend five or ten minutes per bird in recording a long list of facts without regard to which of them are already known (though a surprising number of commonly accepted facts are either not precisely delimited or just aren't so). It is equally impractical for the bander to fail to obtain any such data at all; a very moderate increase in notes taken at almost any banding station, properly selected, will double the practical results achieved at the station. The bander may be aiming at the solution of a specific problem entirely from his own data, but many problems require data from a number of stations. Systematic recording of some characteristic may suggest a new problem and its answer, not even guessed at before the recording began. No two banders will approach these questions in just the same way, but no banding station is giving proper returns for the time devoted to it unless the bander does have an active interest in the questions.

It will soon become evident that common species are the most rewarding, as they alone offer adequate series. One of the great advantages of working with trapped birds is the feasibility of obtaining a long series, perhaps longer than could be assembled from all the museum collections in the country put together. The average measurement in the standard handbooks is based on hardly more than a dozen specimens.

Every netting station can readily record the number of each species trapped daily. Whether adults and immatures, or ♂♂ and ♀♀, can be recorded readily depends on the species (it is hoped that present knowledge of these differences in the live bird can be published in the revised Banding Manual shortly, and that a concentrated effort can then be made to fill in the gaps in our knowledge). Usually this can best be done at a station handling a species in quantity and during a large part of the year.

A wide variety of measurements can be made with no more equipment than calipers and a millimeter rule. The best single text showing the proper techniques is Baldwin, Oberholser and Worley (1931).

Just which measurements are most useful depends on the species and what problem the station hopes to solve; probably the length of the closed wing, tail, exposed culmen and tarsus are the commonest measurements. It will be apparent from the standard handbooks, such as Ridgway (1901-) or Witherby et al. (1940-1941), that for a given species any one or more of these may not be diagnostic in showing age or sex or race because most individuals fall within an overlap, but that some one other measurement may in itself be diagnostic. If the purpose of taking data in a given case is such diagnosis, then accumulation of other measurements is probably useless. The systematic gathering of data on several measurements from each bird handled may lead to corrections in published averages or extremes, or lead to other discoveries, but no station can make every possible measurement on every bird (Baldwin, Oberholser and Worley list some 151 measurements of distance or area, for example), and the gathering of data is thus necessarily somewhat selective. One good approach is to take measurements of several points on some species handled in substantial numbers, going beyond the minimum needed for diagnosis.

Leg measurements (greater and lesser diameters) can be made readily with the Blake gauge (Blake, 1954 and 1956). Not only does this build up data on proper band sizes, but also it may be helpful in separating races or sexes in obscurely marked species.

G. M. Allen emphasized how critically little is known of the progress of molt of common birds, and this is still true. The bander is in an ideal position to make notes and expand our knowledge in this direction. For many of our resident species, a permanent station has the advantage of frequently taking the same bird a number of times and determining the exact timing of changes. However, temporary coastal netting stations may take a large enough sample for the sequence of changes to be determined quite surely. Many of the species taken in quantity at these coastal stations nest so far north that they have not been banded in significant numbers during their breeding season, and thus data from repeats are not available. At Vogelwarte Helgoland, Drost scrutinized migrants trapped for banding, and collected a series with which to classify plumage types (for example, first winter ♂). This series then became the standard by which he recorded age and sex of birds banded (Drost, 1930, 1931, 1932, 1935, 1936). The best single reference of this sort for North American birds is Dwight (1900), but for many species, detailed extensions of and comparison with his data will be useful.

In many cases, the color of the soft parts—eye, bill, etc.—and changes in that color, are even less known than molts. They are often not discernible except with the bird in the hand, yet do not survive accurately in study skins. Whether study skins yield any information of value depends on whether the collector took the time to make out a detailed label, and how accurate his notes were. We don't have any color standard for birds which is precise, portable and popularly priced, but the best choice remains Ridgway (1912), assuming the copy is unfaded.

Taking the weight of birds requires a good pair of scales and a little additional equipment such as plastic cylinders or cones to hold the birds; however, all of this is quite portable. For a general review of ways of taking weight measurements, see Blake, 1956a; see also, Wolfson, 1954a and 1954b, including a method of estimating fat on the living bird. There are several sources for the variation in weight shown by birds: diurnal, seasonal (dependent on the availability of food, or molt, or migration), individual, random (for example, bad weather), or geographical. Most published figures have been raw weights, those made with little attempt to determine the condition of the bird. We badly need more data, and more precise data.

Parasites may be collected with no equipment other than small, labelled vials of alcohol, although at a more permanent station rather simple apparatus can separate substantially all the external parasites from each bird (for the Fair Isle apparatus, see Williamson, 1954b). The bander who has no regular association with an interested entomologist may send Hippoboscid (flat) files to Dr. Joseph Becquaert, Museum of Comparative Zoology, Oxford St., Cambridge 38, Mass., and bird fleas to Mr. R. Goelet, 546 Fifth Avenue, New York City. Each vial should indicate date (at least month and year) and place of collection, species of bird involved, and name and address of collector. A good introductory discussion of these parasites is available in Rothschild and Clay (1952).

SPECIFIC PROBLEMS

While the most valuable contribution the bander can make is to solve problems not previously visualized, a good many examples can be cited of those solved for some species but not others, or already visualized but not yet solved.

A wide variety of data may be used to suggest areas of origin of migrants—the species captured on a given day, or the relative proportion of ♂♂ and ♀♀ or adults and immatures. This is illustrated by waves of Willow Warblers at the Isle of May and Fair Isle, on successive days but of different origin (Williamson and Butterfield, 1954). A problem which might well be approached in this way is the origin of fall passerine migrants on outer Cape Cod—whether by drift on a northwest wind across Massachusetts Bay, or by direct flight from Nova Scotia (Bergstrom, 1956b). As few coastal netting stations will be near weather bureau stations, it is desirable to keep rough notes on such points as maximum and minimum temperatures, wind direction and strength, cloud cover, and precipitation, for comparison with the daily weather map.

At times, the presence of a few rarities—species or races—in the day's take of birds may suggest origin of the migrants as a whole. A substantial proportion of the great rarities occurring at a banding station will be seen for the first time in the trap or net, or not even tentatively identified until they are in the hand. Reports at the British bird observatories are the best proof of this, since sight observation of migrants is carried on systematically, along with the trapping. Species which remain in heavy cover or are obscurely marked are particularly likely to be missed unless trapped.

It may be argued that these rarities mean nothing except to "bird golf," or that at most the reports help to show a species to be regular in very small numbers rather than casual or accidental in a given region. However, "rarities take on a new significance and become important facts as well as exciting events" (Cornwallis, 1954; further illustrated by Davis, 1954) when related to other migration data, as long as they are kept in perspective with other studies of larger samples of birds.

Stations in North America are dealing with more homogeneous populations than those in Europe, so that a sample of migrants can less often be characterized by the races involved. One subspecies occurs all the way from Quebec to the prairie states in most cases while in Europe Scandinavian populations can often be told from Siberian, from central European and from those in Great Britain (Witherby et al., 1940-41).

At times, existing ideas on the distribution or migration of the several races of a species can be revised effectively on the basis of careful notes on trapped birds. Fair Isle data, including measurements of the folded wing (a useful index to body volume), showed the Iceland race of the Merlin to be a regular migrant (Williamson, 1954c).

When data on banded birds are insufficient for subspecific problems, collecting is easy, and much more selective and efficient than by other methods [this of course requires specific Federal and state permits, in addition to the banding permit]. While it is helpful for the collector to be able to make a good study skin, those who have not acquired this skill or who hesitate to keep the necessary poisons in a house with small children can often accomplish a good deal by keeping the specimens in the home freezer until a convenient opportunity to pass them along to a systematist for study.

Even in Massachusetts, an area which has been studied intensively, Griscom and Snyder (1955) discuss a number of species where more specimens are needed to solve questions of the distribution of subspecies, such as the three subspecies of the Veery or of the Yellow Warbler which may occur in the state. Such existing records as can be substantiated do not go very far in establishing the exact season of migration and relative abundance of the races.

In general, specimens for such purposes must be taken without previous bias to be valuable, to show the *average* color of the back, for example. A sample showing only the most highly colored individuals does not reveal whether there is an even gradient from those to the dullest, or whether a gap is in fact present. Subspecies which are distinguished on the basis of 80% of one being distinguishable from 80% of the other need samples as random as possible, such as all the individuals of that species captured on a given day, or every tenth individual. Only for those few subspecies which can be distinguished in the field is it feasible for a sample of specimens to include only the birds believed to be of that subspecies.

The need for a series rather than single specimens can hardly be overemphasized, as too many attempts have been made to establish extra-limital records for a race based on a single specimen which may represent only an extreme variation in the local resident race.

The daily list of species trapped or netted at a station, broken down as far as possible by age and sex and race, has a number of uses. It helps directly in showing differences in time or route of migration for adults and immatures or ♂♂ and ♀♀. By comparing the lists for a given day at several stations along the same "flyway," it can be determined whether the peaks of migration for certain species are local or whether they are shared by two or more stations. If they are local, it would appear that the migration was on a narrow front or from a different direction. Drift migration tends to show more coincidence of peaks at different stations than the steady movement of birds following the coast as a leading line.

Netting stations are in an excellent position to make quantitative measurements of how weather affects migration. Data from a series of stations, together with the daily weather map, can extend our knowledge of these fluctuations. An example from Fair Isle, on the Chiffchaff, may be found in Williamson (1954a).

In the northeastern United States it has long been common knowledge of field observers that late spring waves of migrants were generally most striking on a southwest wind, and fall waves on a northwest wind, but current studies (for example, Bagg et al., 1950) go far beyond this simple beginning. On a small scale, we have questions as to how migrants behave when a cold front squall or thunderstorm arrives.

We need more data on which nocturnal migrants are also diurnal, and the reasons why diurnal migrants may be concentrated in the morning hours or—as at Nantucket (Dennis and Whittles, 1955)—more constant. Coastal netting stations almost always yield worthwhile incidental observations on diurnal migration, and a combination of netting and sight observation is the ideal approach for any station which is concentrating on problems of diurnal migration. Observations *limited* to spots which are suitable for netting stations may be misleading (see the several papers on visible migration which make up *The Ibis* for April, 1953.

We need more studies on the activity of migrants during temporary stops—how long they rest in one locality (especially in relation to the length of the stage immediately before or after), how their weight rebounds during the rest period, what their local movements are. It may be hard at times to distinguish random local movements during a rest period from the slow movement of diurnal migrants which feed as they go. Any evidence that a species is primarily a nocturnal migrant moving in long stages, but with some slow diurnal progress in the direction of migration during the intervening rest periods, would be of great interest.

Color marking would be helpful, but needs careful planning, to avoid conflict with other color marking schemes. Virtually none of our birds are completely sedentary (see, for example, Bergstrom, 1955), so that it is not entirely safe to duplicate markings for the same species in different regions. The odds against a particular color combination in one region representing a bird banded in another are very substantial, yet a known overlap in combinations used must cast doubt on results announced by either bander. Any plan to use color markings on birds banded in the United States must be cleared in advance with the Fish and Wildlife Service, which is attempting to eliminate conflicting markings.

Where terrain limits migrants locally to a narrow route (for example, a few thickets along a sand spit like Monomoy Point in Massachusetts), it would be instructive to set up netting stations in several thickets to check the extent and direction of daytime movement from one to another, whether birds tend to visit each such oasis on their route, whether the movement appears to be local or migratory, and how fast the individual bird travels.

Where netting and sight observation are carried out at the same spot, there is almost no end to appropriate subjects for study. We lack full information on any preference for one type of vegetation or terrain. We lack much direct evidence on whether in some species mated pairs migrate together in spring. A worthwhile contribution to the current controversies on bird navigation (see Allen, 1956) might be made by taking a number of some common species from the point of netting to a nearby open area (such as a salt marsh), release them one by one, and record initial direction of flight, comparing the results obtained on a sunny day and one with complete cloud cover.

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SUMMARY

Methods, other than traps or nets, for sampling passerine migrants are discussed briefly. They include sight observation, telescope observation of birds crossing the moon, and birds picked up dead at high buildings.

A general discussion of the relative advantages of traps and Japanese mist nets suggests that the nets are far more effective.

The number of distant recoveries of birds netted on migration is not likely to justify the labor of banding, but a wide variety of data recorded at the time of banding can be used to great effect without further captures of the individual bird.

APPENDIX I: SCIENTIFIC NAMES OF SPECIES MENTIONED IN THE TEXT

Merlin, *Falco columbarius* (in the A.O.U. checklist, Pigeon Hawk)
Veery, *Hylocichla fuscescens.*
Willow Warbler, *Phylloscopus trochilus.*
Chiffchaff, *P. collybita.*
Starling, *Sturnus vulgaris.*
Yellow Warbler, *Dendroica petechia.*
Black-poll Warbler, *D. striata.*
Evening Grosbeak, *Hesperiphona vespertina.*
Purple Finch, *Carpodacus purpureus.*
Chaffinch, *Fringilla coelebs.*
Slate-colored Junco, *Junco hyemalis.*
White-throated Sparrow, *Zonotrichia albicollis.*

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