more net hours to catch one stray bird prove? Only that another bird was blown, or strayed, off its normal migration route.

We think bird banding is much hard work and more fun, but we believe with all the information banders should record (measurements, weights, ageing, sexing, etc.) surely anything not of definite value should be eliminated.

And we say net hours are not even for the birds!

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MORE ON NET HOURS
By George A. Hall

(Mr. Hall is the editor of The Wilson Bulletin. -Ed.)

I would like to add a hearty AMEN to the remarks made by Mabel Warburton in her commentary, "Net-Hours: The Myth of their Importance" (1967, EBBA News, 30:158-160). Mrs. Warburton has put into print the same conclusions that I reached several years ago while trying to analyze my own Operation Recovery data. In summarizing and illustrating these conclusions most effectively and most interestingly, Mrs. Warburton has done us all a great service. I would, however, like to add some comments of my own.

Since we are discussing the fraction: number of birds banded/net hours, I think we should perhaps start with a short arithmetic lesson. The numerator of this fraction (number of birds banded) is the only part that we are really interested in and we hope to compare this numerator with those from other fractions at our own or other stations. To make a fair comparison, however, we must convert the simple number of birds banded to a fraction by dividing by some denominator. In any fraction the denominator is every bit as important as the numerator and in the situation at hand it is the denominator that gives us all the trouble.

If our denominators are not comparable then our fractions will not be comparable. To give a homely example, suppose that my O.R. partner Ralph Bell is selling his eggs at 50 cents a dozen, and a competitor is selling them at 75 cents a dozen. Since everybody understands what is meant by a dozen, and since both Ralph and his competitor mean the same thing by the word "dozen" we can confidently say that Ralph's eggs are the cheaper. But suppose that the competitor defines a dozen as 20 eggs? Then who is selling the cheaper eggs? We can no longer make an easy comparison since the denominator (dozen) is no longer the same in the two cases. Mrs. Warburton has demonstrated several reason why her denominator (net hours) may not be representing the same thing as my denominator, and hence why she and I cannot get a valid comparison of our data if we compare the fractions, of birds/net hours.

I wish to show here that the problem goes beyond this, and that it is entirely possible that my own data from one day are not comparable with my data for a different day, when expressed as birds/net hours. Our fraction, birds/net hours begins to become particularly useless when either the numerator or the denominator gets to be very extreme, either very large or very small. As with all fractions, a very small denominator produces a large fraction whose significance is doubtful. Consider the following example. On September 29, 1966 at our Allegheny Mountain O.R. station we banded 100 birds in 98 net hours giving us a ratio of 1.02 birds/net hour. On October 1 we had banded 17 birds in 15 net hours (a ratio of 1.13 birds/net hour) when a heavy rain and snow storm not only forced us to close down operations but also effectively stopped any migratory flight. Clearly then September 29 was a day of heavier migration, but the net hour ratio makes both days appear about the same. This result comes from our very small denominator on the October day.

As another example consider the problem of a station that operates only on weekends, as ours often does. On Saturday we may operate 10 nets for perhaps 12 hours giving us a net hour total of 120. If we caught 60 birds on that day our capture ratio is 0.5 bird/net hour. On Sunday, however, we usually have to cease operations at about noon since we must drive over 100 miles to our homes. This would give us only 50 net hours with 10 nets, and if we also caught 60 birds we would have a capture ratio of 1.2 birds/net hour, a much better figure than on Saturday. But, at our station very few birds are caught after 10 am. and so the banding of 60 birds on each day in reality means that the intensity of the migratory flight was about the same on the two days, all other factors being equal. This illustrates the point that a net hour between 7 and 8 in the morning represents something quite different than a net hour between 2 and 3 in the afternoon.

To give a specific example of this "weekend effect": On September 30, 1966 we banded 345 birds in 75 net hours (a ratio of 4.6 birds per net hour) and on October 2, 1966 (a Sunday) we banded 195 birds in 41 net hours (a ratio of 4.78). The net hour ratios make the two days look about the same, but at the time it was obvious that September 30 was a very heavy migratory day, and October 2 was not.

On a slow day at our station one bander can easily handle 10 nets or more, but on a good day a lone bander (which is often our situation) may be hard put to handle a single net. We have caught over 100 birds in one net in one day. Qualitatively it is obvious that a good day is better than a slow day, but a quantitative comparison is not possible since there is a great difference in meaning of the number of net hours on the two days.

The examples I have given above should make it obvious that it is not possible in most cases to make good quantitative comparisons with the day to day data at one station, let alone with the data from another station.

In preparing an analysis of our data for a paper given at the XIV International Ornithological Congress, I found that computing the birds per net hour resulted in a completely chaotic situation. I was forced to compare the number of birds caught from day to day in order to get any organization out of our information. This figure is admittedly not correct and so my analyses were only qualitative.

In his interesting paper on The Mathematics of Migration, Preston (1966. Ecology, 47:375-392) used the Island Beach O.R. data for Blackpoll Warblers. Although he stated, "...it is doubtful that the number of birds caught is in fact proportional to the net hours." he did utilize the fraction, birds/net hours, and obtained a reasonably satisfactory correlation. I have attempted to utilize our West Virginia data (which involve about the same number of Blackpolls) in Preston's analysis, following his method exactly, and I do not get nearly as good correlation as he does. In a review of Preston's paper, Nisbet (1967. Bird Banding, 38:154) commented on the "crudeness" of the data used. He then suggested that "dozens of banders must have better data in their files". I would suggest that Nisbet is wrong, and that at this time there are possibly no banding data in existence that would give really meaningful comparisons of the type Preston was attempting. If such data do exist I have not seen them.

The Operation Recovery data are impressive as to the numbers of birds banded (a useless figure in itself); good on weights, and on sex and age classes of the migrants. These last have led to interesting ideas on differential migration (see for example: Murray and Jehl, 1964. Bird Banding, 35:253-263; Mueller and Berger, 1966. Bird Banding, 37:83-112; and Hussell, Davis and Montgomerie, 1967. Bird Banding, 38:61-66). But the net hour fallacy makes it almost impossible to obtain meaningful comparisons between stations, or to work out correlations of migration intensity with the weather (as I have attempted without much success) or to do the sort of thing attempted by Preston.

At present I see no clear answer to these problems. This fall at our O.R. station we are going to try the experiment of operating three selected nets every day from daylight until 10 o'clock. Of course, birds will be caught at other times and in other nets, but only the data from these three nets will be compared and analyzed. I recognize in advance that these data will not be completely accurate either. On some wind conditions our predesignated nets will not properly sample the flight, either undercatching or overcatching, but I see no way of overcoming this.

We are in great need of a new idea about a method of reducing the gross numbers of birds caught to a figure that can be used as a meaningful datum. Operation Recovery is now entering its second decade, but if all of this effort is to be more than "a bander's carnival" long on fun and frolic but short on usable scientific data we must find some way of doing this. It is a problem we all need to think about, and by all means

the people at Laurel who promote Operation Recovery have the responsibility of helping us in this matter.

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A PORTABLE "POND"

By Peter G. Davis

(Reprinted from The Ringers' Bulletin Vol. 2, No. 10, Dec. 1966: bulletin of the Bird Ringing Committee of the British Trust for Ornithology.)

It is well known that moving water is one of the best baits for most small birds and two excellent methods of arranging a water-drip are described in "Trapping Methods for Bird Ringers" but the choice of a receptacle into which the water drips is left to the trapper.

For small traps - Chardonneret or Potter types - a small phtographer's developing tray is probably as good as anything, but for a large wire trap, a Heligoland, or for use with mist nets something very much larger is obviously desireable. If it is readily transportable, so much the better.

We found that the answer is an eight-foot length of grit-coated roofing felt. This can be carried to the site as a roll and may be laid in one of two ways. For a permanent site, it is worthwhile excavating a shallow cavity four inches shorter than the length of the felt and four inches shorter than its width (i.e. 32 inches), but for a temporary site all that is necessary is to unroll the felt, grit-side uppermost as it gives a better foothold, and to raise the outside edges with stones, grass roots or earth. The weight of the water will be sufficient to form a basin about two inches deep, 32 inches wide and as long as you like. Again, for a permanent site, a few rocks and a little clean sand will provide bathing places for the smaller fry and make the pool look a little more natural - ours even has a patch of marsh grass in one corner - but these are not really essentials for a "portable" pond.

The drip device is erected about two feet above the water level and the resulting ripples are visible for at least fifty yards. In a large wire trap it would, of course, be necessary to place the water either near to the entrance or - perhaps preferably - well inside with a funnel entrance leading to it.