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A SYSTEM SURVEY OF A BIRD OBSERVATORY: PART I. A RECORDING FORM FOR BANDING DATA

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INTRODUCTION

In 1969, one of the authors (Salvadori) became involved in processing banding records for the Ontario Bird Banding Association. He soon realized that the processing had to be automated if large numbers of accumulated but scarcely analyzed records were to be used. Approximately 100,000 records were on file and at least 10,000 were being added for each normal operating year. With the help of Gary Page of the Point Reyes Bird Observatory, an experimental recording form and scheme were designed. The intended design of this form was to allow easy recording and processing, and to measure the average bander's reaction and capability of using rigid schemes that allowed later computerization.

This first form was publicly released at the Annual General Meeting of the Ontario Bird Banding Association in Toronto in 1970 and was used at Long Point and Point Pelee Bird Observatories during 1970 and 1971. Such experience proved valuable in designing a final form described below.

In the fall of 1970, the Manomet Bird Observatory began automating its records after independently arriving at some of the same conclusions which initiated the Long Point effort. It was clear at MBO that the scope of individual interpretation allowed by the existing recording formats caused wide variations in the quality of the data and significant shifts over time in the absolute meaning of much of the mensural information. It was also apparent that the data were simply inaccessible to meaningful analytical treatment due both to volume and format, and that machine processing was the only solution.

OBJECTIVES

Since few bird-banders have knowledge of data-processing systems, one of our primary objectives was to make a form which was simple and easy to use. Such simplicity is a vital consideration and must not be underemphasized. When banders get a trap full of birds, they do not want quick and efficient data gathering hindered by cumbersome recording forms, or the necessity to consult numerous code lists. To this end, our forms present each item in the order that may be used to obtain information from a bird in the hand, pro-

vided such information was deemed common to most banders. Some exceptions will undoubtedly occur. The most frequently required codes are on the form itself.

Another important consideration was to use as many numerical codes as possible because this facilitates automatic processing in two ways. First, if mechanical sorts are to be made, a single pass would suffice. Second, scientists analyzing data in FORTRAN would need numerical data because FORTRAN has limited capacity in handling characters. However, numerical codes do not hinder using computer languages like COBOL or PL/I, both of which are more suitable for editing data, producing reports, and for general information retrieval. In passing, one argument against using numerical codes is that errors occur more frequently than with alphabetic data. For example, it is easier to write F for female than 5. At Long Point Bird Observatory, where most banding is done by "week-end" banders, a 5 per cent error occurred with numerical codes. People just do not like to think in numbers. Numbers are associated with the dislike of mathematics among the general public and thus there is also a psychological barrier in the numerical recording.

Consultation with the Bird Banding Laboratory indicated that a general, although low-key effort to upgrade the average skill level of licensed banders was under way, principally through more diligent scrutiny of applicants. The BBL indicated that the general skill level of permittees was becoming such that the use of numerical codes should not prove difficult and indeed would be an additional indication of care and diligence in record keeping.

In order to further facilitate record handling, individual records were limited to 80 characters thereby allowing use of familiar Hollerith 80 column cards. This, though restrictive, is desirable because processing of variable length records is time consuming and too complicated for the average users of the data.

Another important objective was recording critical codes which could be automatically cross-checked for validity. This is important because recording errors are frequently made and therefore should be automatically detectable in the same manner as the BBL error-checking programs. The most necessary validity check is of the species being recorded. To minimize the error in this field, a special United States Public Health Service code is used in conjunction with the American Ornithologists' Union number. Salvadori further felt that a third check was required on original recording sheets and that space *could* be provided for the *full* species names. Although this information would not appear in the machine readable record, it would be available for visual verification on original forms.

The last objective was to place all data normally collected by bird observatories and independent banders in the first 50 columns of recording forms. The remaining 30 columns would then be available for additional data necessary to independent studies. Additionally, this ensures that data recorded within the first 50 columns would be in the same form for all banded birds and could be easily treated by routine programs.

FORM DESCRIPTION

Examples of the form devised are shown in Figures 1 and 2. Although these forms have significant differences, columns 1-50 in both forms record the same information, whereas columns 51-80 allow for the individuality of recording which takes place at the various observatories and indeed of the individual banders using the form.

The field definition and codes for the first 50 columns are presented below. A few notes that apply generally should be considered first:

1. Except in the SPECIES field (cols. 16-19), all entries are numbers.
2. Only one character per column.
3. A dash (—) signifies data not taken.

Permit Number, Cols. 1-5

This number identifies the bander or organization to whom the bands are issued. Four digit permit numbers are entered right justified, i.e., permit number 1234 is entered 01234.

Retrap Code, Col. 6

This code separates new bandings from repeats, returns, etc. The codes are:

1. New banding.
2. Repeat.
3. Foreign Recovery.
4. Band destroyed.
5. Rebanded repeat or return (complete old band number should be entered in note columns).
6. Rebanded foreign recovery (as 5 above).
7. Return (bird banded by bander more than 90 days prior to recovery).
8. Band lost.
9. Record error, lost or not taken.
0. Dead bird, or bird intentionally not banded (e.g., injured).

Band Number, Cols. 7-15

As a rule, the sixth digit from *last* in a band number identifies the size. However, this is not true of some sizes (0 and 1) presently in use. As these bands are used up, their replacements will carry this significant sixth digit. Until such time, it will be necessary to leave a space in columnn 10 where band size would normally appear. In addition, there are many band series using three-digit prefixes rather than the four digits.

The proper entry of band numbers has been the single most prevalent source of difficulty in using this new recording format. In general, when recorders are aware of the two anomalous situations (missing size digit, or three-digit prefix) there is no problem. But when separate sheets are used for each band size and the recorder starting a new sheet makes an error, the follow-the-leader effect may go on for pages! The examples given below illustrate proper entry sequences.

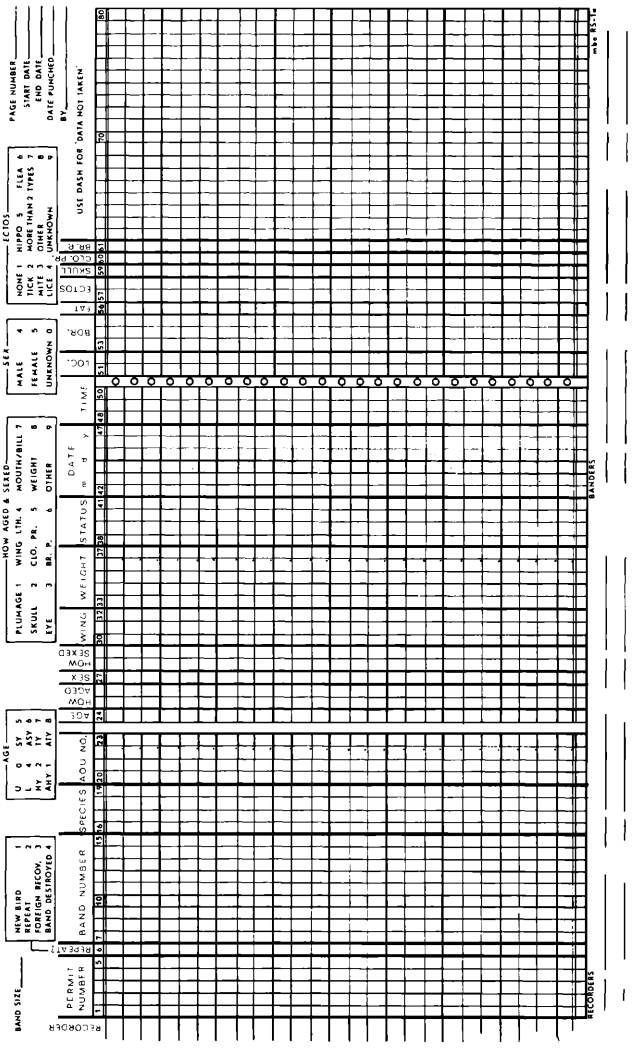

FIGURE 1. The Manomet version of the form.

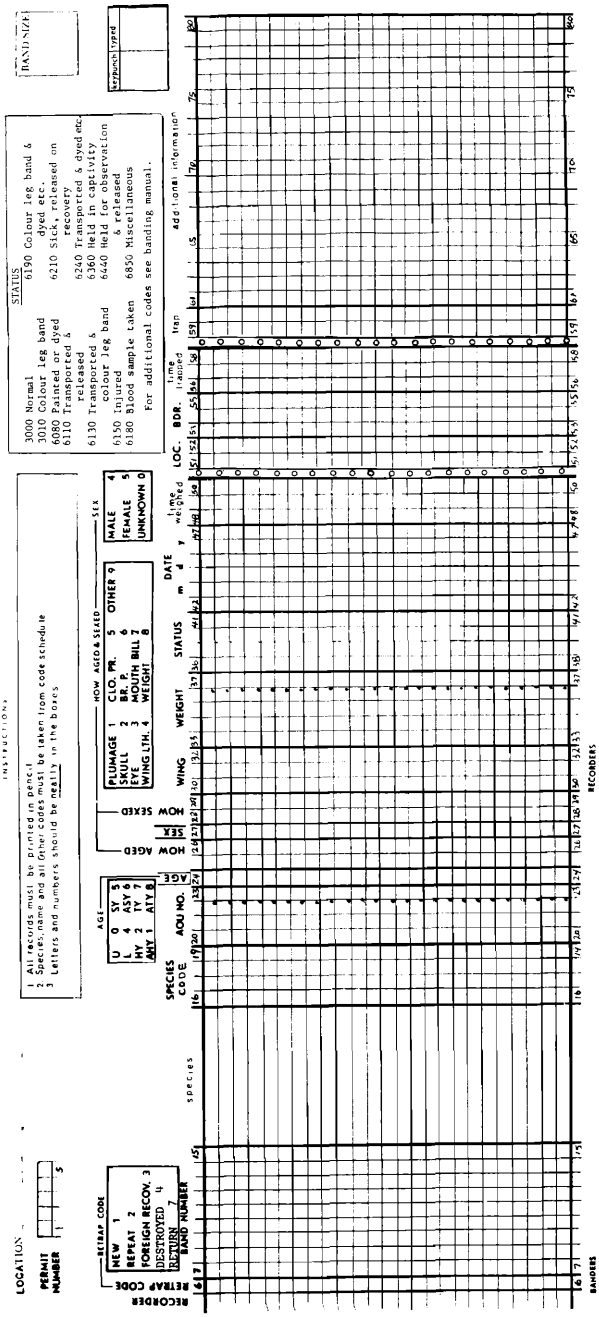

FIGURE 2. The Ontario Bird Banding Association version of the form.

Size 0	121_90900	Size 1B	109150034
Size 1	078_76640	Size 2	075232212
Size 1A	075153961	Size 3	100392154

In each case, the underscored space or zero was supplied by the recorder.

Species, Cols. 16-19

Species are identified using a four-letter standard abbreviation code as developed by the Bird Banding Laboratory. This listing as published by the BBL also includes common names, AOU numbers, and recommended band sizes. Examples of the abbreviations are given below.

Black-capped Chickadee	BCCH
Mourning Dove	MODO
Barrow's Goldeneye	BAGO
Baltimore Oriole	BAOR
Sharp-tailed Sandpiper	STSA

AOU Number, Cols. 20-23

The AOU number is entered right justified. A decimal point is preprinted on the sheets between columns 22 and 23. Some AOU numbers have a decimal component, e.g., Nuttall's White-crowned Sparrow, 554.8. If there is no decimal number, enter a zero. Finally, fill unused columns with zeros, e.g., Tufted Puffin, 012.0.

AGE, Col. 24

Entered as a single digit using the BBL code. Codes are:

Unknown	0
Local	4
Hatching Year	2
After Hatching Year	1
Second Year	5
After Second Year	6
Third Year	7
After Third Year	8

HOW AGED, Cols. 25-26

The HOW AGED and the HOW SEXED field use the same code numbers. If only one characteristic is used, leave the second column blank; if age is unknown, both columns 25 and 26 remain blank. If the code 9 (other) is used, an explanation must be supplied in the notes area, e.g., at Manomet, from 1 January to late spring, most birds are AHY (1) by other (9), with the note 9TOY meaning "the 9 means time of year." The codes for HOW AGED and HOW SEXED are as follows:

1. Plumage
2. Skull Ossification

3. Eye (or eye-ring) color
4. Wing length
5. Cloacal Protuberance
6. Brood Patch
7. Mouth or Bill color or length
8. Weight
9. Other

SEX, Col. 27

Entered as a single digit using the BBL codes:

0. Unknown
4. Male
5. Female
6. Originally unknown, subsequently determined upon recapture to be male
7. Originally unknown, subsequently determined upon recapture to be female

HOW SEXED, Cols. 28-29

See HOW AGED and treat in a similar manner.

WING, Cols. 30-32

Natural chord is measured to the nearest millimeter, right justified, unused columns filled with zeros, e.g., 62 mm entered as 062, 146 mm as 146.

WEIGHT, Cols. 33-37

Measured in grams and tenths. A preprinted decimal is placed between columns 36 and 37. Enter right justified and fill unused columns with zeros. 134.7 grams is entered as 01347. The preprinted decimal is properly placed such that the weight may be read back as 134.7. A weight of 67 grams would be entered 00670.

STATUS, Cols. 38-41

The BBL is implementing a four-digit status code. Until it is released, the old three-digit codes should have a final zero added, e.g. a normal bird is status 3000 rather than 300.

DATE, Cols. 42-47

Entered month, day, year. Be sure that in the case of single digit numbers they are *preceded* by a zero. January 1, 1973 would thus be entered as 010173. If the recorder entered the date as 1 (space) 1 (space) 73, many computers which read blanks or spaces as zeros would arrive at a date of October 10, 1973!

TIME, Cols. 48-50

A preprinted zero follows column 50. Although it appears on the banding sheet, it is not punched on punch cards, and is thus ignored in the data processing. This was done in order to save a full column. By making the final time digit always zero, time can be recorded to

the nearest 10 minutes, certainly accurate enough for banding purposes. This time is the time of banding, generally synonymous with the time of release. The OBBA form (Fig. 1) has additional space (Cols. 56-58) for recording the time of capture as well.

This illustrates the utility of standardizing only the first 50 columns of the 80 column space. In this case, OBBA has determined that time of capture is important as well as time of release and has thus provided for these additional data outside the fixed 50 column area.

Time is recorded using the 24 hour clock, entering only the first three digits, as in these examples:

TIME	IS ENTERED	AND READ
8 AM (0800)	080	080(0)
9:30 AM (0930)	093	093(0)
2:20 PM (1420)	142	142(0)
6:35 PM (1835)	184	184(0)

Note that the last entry was rounded to the nearest even 10 minutes. In each case, the final zero in the "AND READ" column was not recorded or punched, but merely understood.

This completes the field and code descriptions for the basic 50 column format. As an example of one way in which the remainder of the form space might develop, the uses of columns 51-61 at the Manomet Bird Observatory are listed below:

Cols. 51-52: A two-letter location code. MBO itself has available locations AA-AZ. Each of the Observatory's sub-permittees has a 26 code group which starts with the sub-permittees permit letter, thus sub-permittee 09859B uses BA-BZ, sub-permittee F uses FA-FZ, etc. Each location code has a cross-referenced entry in a card file which may be entered by code letter, geographical description, or latitude-longitude coordinates.

Cols. 53-55: A three-letter bander identification code.

Col. 56: Fat, quantified on a 5 step scale.

Cols. 57-58: Identification codes for ectoparasites collected from the banded bird.

Col. 59: Skull, a single digit recording the degree of ossification in thirds.

Col. 60: Cloacal Protuberance: Single digit, five step code.

Col. 61: Brood Patch, single digit, seven step code.

Col. 80: Additional information. Often there are times when either more information is to be recorded than is allowed within the confines of the 80 column format, or when some physical object, e.g., a feather is to become a part of the banding record. To facilitate this important consideration, MBO uses a single digit code in column 80. The presence of a number in Col. 80 means that additional information in some form has

been taken for that particular bird; the specific code number gives a rough indicator of the type of information, e.g., Code 2, molt data; Code 5, deformity data, etc. A standard 3x5″ note card is then prepared. These cards list band number, species and date, as well as the code number and the additional information, and are filed by band number.

DISCUSSION

The forms described above have now (December 1972) been in use for over a year and it seems that all of the objectives were met. Its popularity has spread and many individuals as well as stations are using it in the United States and Canada. The learning threshold of how to use the form seems to be very low and the average individual seems to be able to use it by simply reading the instructions outlined above. The authors certainly hope that many more data will be processed as a result of people using this form, from which the information can be immediately converted to a machine readable form. Indeed this has already happened and in subsequent papers some of the algorithms used to edit and analyze the data will be explained by means of flowcharts or simple programs. This should also be a stimulus for the exchange of information among banders since no conversion of data will be required.

Our hope is that the banding laboratories will accept our "standdard" and will in the near future accept banding information not on the forms in current use but in this new style.

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