Verifying the Accuracy of Band Recovery Information

C. Stuart Houston
863 University Drive
Saskatoon, Saskatchewan S7N 0J8

Charles M. Francis
410 Huron Avenue South
Ottawa, Ontario K1Y 0X1

INTRODUCTION

Band recovery data are potentially valuable sources of information on movements, survival rates, and causes of mortality of birds. With the widespread availability of computers and development of new statistical models, one can anticipate an increase in using band recovery data. All such studies are dependent upon the accuracy of the recovery data. Errors in reported locations or dates may lead to erroneous conclusions, especially for species with low recovery rates where individual recoveries are proportionately more important. Survival analyses were formerly based largely on "life-table" models, but these have been shown to be inappropriate for banding data, because their assumptions are not all met (Anderson et al. 1985). Instead, powerful new statistical models, such as those of Brownie et al. (1985) for recovery data or new versions of the Cormack-Jolly-Seber models (Lebreton et al. 1992) for recapture data, should be used for survival analysis. Even for these models, date of death must be reported accurately. Unless additional information is obtained from the band finder, one must exclude bands that might have been found long after the bird died, especially birds reported with how-found codes "50" (skeleton only) and "98" (band only). Code "56" (band obtained) must be viewed with equal suspicion. Analyses of the cause of mortality are statistically difficult because of variation in finding rates for different causes of death. However, if carefully used, cause of death can provide valuable information on temporal or geographic variation in mortality factors such as hunting. Again, analysis is dependent on the accuracy of the reported cause of death.

In North America, recovery information is based on the report from the finder of the band to the banding offices in the Canadian Wildlife Service or U.S. Fish and Wildlife Service. Inaccuracies often arise from inadequate information provided by the finder (who may not appreciate its importance) or, more rarely, from errors in the processing of the data in the banding office. Inadequate information on the cause of death is particularly likely because many people are not specific in telling how the bird died, reporting, for example, "found dead" instead of "dead on highway" or "electrocuted below a power transformer." This paper reports our experience in contacting band finders to verify accuracy of the original computerized reports and to obtain additional information when necessary. These efforts allowed an additional 36 records to be used in our paper on after-survival rates of Great Horned Owls (Houston and Francis unpubl.).

METHODS

This paper is based on 481 recoveries reported through 30 April 1993, from 6614 flightless young and 28 adult Great Horned Owls banded between 1946 and 1992 (Table 1). (Our companion manuscript on owl survival uses only owls banded through 1987 and reported before 30 April 1990.)

Contact with band finders occurred in two ways. Either the finder contacted CSH or CSH attempted to contact the band finder. The aim of contacts in the early years was to determine distance travelled by each owl, to the nearest half mile. Either because the information seemed complete, or occasionally because of pressures on time, contact was not made with 42 finders in Saskatchewan and 28 elsewhere. Contact with United States finders was usually attempted only when there was

ambiguity about exact date, location, or cause of death. Two band finders were not contacted because CSH had not then received the initial computerized report, which contained addresses of band finders; knowledge of these two bands was obtained years later in a computer printout of all of CSH recoveries.

Sixty-nine recoveries were reported first to CSH, rather than directly to the banding office; full details were gathered then and were reported by CSH on Bird Banding Recovery Report form 3-1807. This early contact, prior to submission of any details to the banding office, allowed above-average veracity of this information, especially as regards dates and "how found." Once we changed the code given by the banding office from our 3-1807 report: we reported the owl as found dead in the snow, but with evidence it had been shot; the banding office coded this as "00" and we changed it to "01."

For 347 recoveries, an attempt was made to contact the finder by telephone (237 cases) or by letter with a stamped, self-addressed envelope for reply (108 cases), or by personal visits in Saskatchewan (2 cases), to determine the exact circumstances of the encounter. (Nine owls were reported to six other banders, and were given a "23" code for "who reported"; contact with these banders led to changes in codes for how killed or for locality in five instances). All queries were accompanied by, and all telephone calls were followed by, a copy of at least one published paper telling what had been learned to date from banding owls. This personal touch to pique the interest of the finder, plus the enclosure of a stamped, self-addressed envelope and a phone number that could be called collect, contributed to a response rate far above that expected. Only 11 times was followup necessary after a failed letter, which was made three times by telephone and eight times by letter. Only five finders failed ever to respond, resulting in successful follow-up contact with finders of 342 owls.

Some telephone searches required substantial effort, almost entering the realm of detective work. Two finders had their telephone on an exchange different from their mail address. One finder had no listing by surname, but a phone call to an owl-nest-finding farmer in the same community procured the phone number of the finder's wife's hair styling shop. When children reported an owl, with a postal box number as address, it sometimes took two to five phone calls to families with that surname in that community, to locate the finder. One person with an unusual surname spelling had no telephone listing, but three years later was found through his daughter after a request through telephone information, since the daughter in turn had not yet been listed in the telephone directory. One person with an unlisted telephone number and another who failed to respond to a letter, were visited personally. One Royal Canadian Mounted Police officer was traced through five communities to his current address. One amusing sidelight was an irate farmer whose initial report had been coded "21" (caught in building). An owl had paid nightly visits to his chicken coop, so one night he lay in wait for the owl and shot it as it entered. The farmer requested but did not receive recompense for the two goslings and four pigeons the owl had killed the previous week.

RESULTS

Duplicate reports

Identical recovery information was given on the computer printout for band numbers 508-08152 and 508-08353. When the band finder reported to CSH that his "certificate of appreciation" gave the wrong band number, a specific enquiry to the banding office confirmed that the first was a clerical error. Unfortunately, although the correct number was added, the wrong number was not deleted from the computerized records.

Date of recovery

Of the 342 recoveries for which contact was made with the band finder, no change in date was made for 283, while additional information about the date of recovery was obtained for 59 owls. This was especially important for the 33 instances where the computer report gave the day of the month between 51 and 81; the addition of 50 indicates the date the letter was written or post-marked. For example, 02-57-92 means the bird was reported in a letter dated 7 February 1992. Since the finder had made no mention of when the band was found,

the date might have been for a band kept for several years before it was reported.

In these 33 instances where the computer printout gave only the date of a letter and in two additional instances where only the year was given, it was possible to obtain either the month or the exact day when the band was found, thereby making 35 additional records eligible for estimating survival rates. Eighteen of the 33 proved to have been recovered in the same month as the letter date, 10 were recovered in the previous month, and five more than one month from the date of the letter (8, 7, 5, 5 and 4 months), placing two of these five owls in an earlier "year." (We considered 1 May as the start of the owl's year, as this is the average hatch date).

Among 24 other imprecise dates, additional information was gained for records already correctly placed within a known 12-month period and hence already eligible for use in a survival table: 11 were changed from "hunting season" to a specific month, 13 were given a specific date or a ten-day period within the month, and one was changed to a previous month. In addition, four coded as exact dates were changed: one by five days, one by ten days, one by 29 days and another by ten months; the latter was an adult owl that had been shot ten months earlier than the specific date reported.

Change in cause of death

Contact with finders also produced corrections or more exact information as to the cause of death for 99 owls (Table 2). Every number not in bold print in Table 2, represents a change in "how found." For example, of 172 owls reported as code "00" (found dead), further enquiry caused changes in 69 instances, including 30 killed on roads (codes "14" and "45" combined), 18 electrocuted and 8 shot. Five of the six initially reported as code "98" (band only), would not have been eligible for a survival table without the extra information as to the means of death. Another record would have been excluded because it was reported as code "50" (skeleton), but even though this code was retained, additional information allowed certainty as to the year of death; the skeleton was found in April in a granary that had been cleaned thoroughly in September, so clearly the owl had died during the winter. In all, excluding one band already counted among those with date changes, another five owls became eligible for the survival table.

Change in place of recovery

Contact with band finders indicated that 280 of the 342 records checked were correct as regards the reported 11 x 18 km recovery block or "latilong." However, 62 resulted in changes in these 10-minute (10') blocks of latitude and longitude: one corrected a banding office error which gave the recovery latilong as "415-0842" in Michigan for an owl actually recovered at "513-1062" in Saskatchewan. Essential new information was obtained concerning six previously unknown recovery sites, four coded as "000" for latitude and "0000" for longitude, and two coded only to the inclusive one-degree block (there are 36 10' blocks in a one-degree block).

The other 56 changes were relatively minor (all involving 10' blocks), 36 varying the recovery location by one block of latitude or longitude and 7 by one block each in both latitude and longitude. Six changed by two blocks and 1 by three blocks in the same direction, and 1 changed by two blocks in each direction. Another two changed by one and two blocks, 1 by one and three blocks, 1 by two and three blocks, and 1 by three and four blocks, in each direction, respectively.

DISCUSSION

Additional information obtained by contacting band finders added 36 recovery records to the 336 original records suitable for analysis of survival in Great Horned Owls. Thirty-one resulted from changes in originally unacceptable or absent dates, and another five from changes of additional information concerning originally unacceptable how found codes (Houston and Francis unpubl.). In addition, five extra records became available for analyzing movements, and the accuracy of analyses of cause of death was increased greatly. Following verification, there were no longer any records that had to be excluded because of incomplete information on the date of recovery, but six recoveries remained excluded because they did

not provide adequate information on when the bird died. Following bander contact, four owls were still reported as code "50" (skeleton) at 1, 3, 5, and 6 years after banding; each of these might have died a considerable time prior to the finding of the skeleton. In addition, one owl was excluded because of code "98" (band only), one year after banding.

Such contact is time-consuming but in terms of the initial cost of owl banding, estimated at five to ten dollars per owl banded and perhaps one hundred dollars per recovery (including the cost of maintaining and operating a Toyota Land Cruiser Wagon which covered 21,185 km in raptor banding in 1992), an average expense of about one dollar to verify each record seems modest. Banding small passerines may be much less expensive, but with recovery rates of 1 in 1000 or less, the cost per verified recovery may well be similar.

For analysts working with existing data sets provided by the banding office, contact with band finders may not be practical or feasible—information on the person reporting the band is not provided on those computer printouts. Our experience suggests that one can have better than 90% confidence in using dates obtained from general printouts of unverified recoveries. Even among those 33 of our recoveries which indicated letter dates, only five were changed to more than 30 days earlier than the date of the letter, and only two to a different "banding year." Recovery locations, when reported on the original printout, were also fairly accurate, with one serious exception in our experience; apparently unusual recovery locations should be verified with the banding office. Thus it would seem that analyses of movement or survival, when based on records with precisely recorded information, should for most purposes have a fairly acceptable margin of error.

Information on the apparent cause of death was much less accurate, with changes resulting from 29% of the contacts (99 of 342). In addition, although we could not test this, inferences by the finder about the cause of death may not be correct. Lowe (1991) reported an experiment to measure band reporting rates, in which dead birds were banded and placed in conspicuous locations, such as on doorsteps or at bus stops. Most (33 of 45) were reported correctly as "found dead, cause unknown" or found dead near a road (2), but 6 were reported as taken by a cat, and four had other incorrect guesses.

Recently, the banding office has been improving their procedures for computerized checking of records, and in spite of work overload through much of the year, sometimes can make time to contact the band finder when information is missing. This should lead to greater overall accuracy in the recovery files. Nevertheless, the personal touch of direct contact by the bander is clearly a worthwhile way to improve accuracy, gain additional information and improve public relations.

ACKNOWLEDGMENTS

We wish to thank Mary I. Houston and Donald S. Houston for assistance in checking and sorting data, and Bruce Eichorst for his numerous constructive comments.

LITERATURE CITED

Anderson, D.R., J.P. Burnham, and G.C. White. 1985. Problems in estimating age-specific survival rates from recovery data of birds ringed as young. *J. Anim. Ecol.* 54:89-98.

Brownie, C., D. R. Anderson, K. P. Burnham, and D.S. Robson. 1985. Statistical inference from band recovery data—a handbook. 2nd edition. U.S. Fish and Wildlife Service Resource Publication 156.

Houston, C.S., and C.M. Francis. Survival of Great Horned Owls in relation to the Snowshoe Hare cycle. unpublished manuscript.

Lebreton, J.-D., K. P. Burnham, J. Clobert, and D. R. Anderson. 1992. Modeling survival and testing biological hypotheses using marked animals: a unified approach with case studies. *Ecol. Monogr.* 62:67-118.

Lowe, K.W. 1991. Preliminary experiments on the reporting of the recovery of banded birds in south-eastern Australia. *Wildl. Res.* 18:413-419.

Table 1. Great Horned Owls banded in Saskatchewan by CSH, 1946-1992.

	Number of Owls				
	Banded		Recovered		
Year	Locals	Adults	Locals	Adults	Total
1946-57	15	5	2	2	4
1958	22	0	4	0	4
1959	70	0	11	0	11
1960	150	1	21	0	21
1961	35	7	6	1	7
1964	69	0	9	0	9
1965	13	0	3	0	3
1966	116	2	11	0	11
1967	258	4	28	1	29
1968	402	1	39	0	39
1969	224	0	28	0	28
1970	285	1	23	1	24
1971	135	0	8	0	8
1972	168	1	19	0	19
1973	50	0	4	0	4
1974	65	0	5	0	5
1975	145	0	8	0	8
1976	107	0	9	0	9
1977	153	0	6	0	6
1978	190	1	10	0	10
1979	211	0	15	0	15
1980	120	0	9	0	9
1981	407	0	19	0	19
1982	197	0	4	0	4
1983	211	1	22	0	22
1984	199	1	14	0	14
1985	113	0	9	0	9
1986	216	0	15	0	15
1987	346	0	28	0	28
1988	296	0	11	0	11
1989	352	0	15	0	15
1990	585	0	21	0	21
1991	259	3	13	0	13
1992	430	0	27	0	27
TOTAL	6614	28	476	5	481

Table 2
Changes to "How Found" Code for 479 recoveries
Great Horned Owls banded in Saskatchewan by C.S. Houston
Same sequence of How Found codes in vertical and horizontal columns
Bold face indicates original and final code are unchanged
All numbers other than bold face numbers represent changes after contact with finder
B=Reported direct to bander, with no change from computer printout
N=Band finder not contacted

	Final code after contact with bander (entire graph, above and below)																										Number changed
	00	01	02	03	04	10	11	14	16	17	21	27	28	45	47	50	54	56	57	89	96	97	98	B	N	Total	
Original code reported																											
00 Found dead	**69**	8	3				1	6		2	1	1		24			18		5					10	24	172	69
01 Shot		**40**			2														1					8	12	63	3
02 Starved			**1**																					2		3	
03 Injured				**11**				1																	2	14	1
04 Caught in trap					**26**																			7	5	38	
10 Banding mortality					3	**1**																				4	3
11 Caught by dog							**3**																		1	4	
14 Struck by car					1			**21**						1										13	10	46	2
16 Scientific specimen					2				**0**																	2	2
17 Drowned										**0**																0	
21 In building		1									**3**													1		5	1
27 Hit by train												**5**														5	
28 Caught by hand	1			1				1					**2**											2		7	3
45 Dead on highway														**23**										9	12	44	
47 Band removed															**2**											2	
50 Band on skeleton	1															**4**			1							6	2
54 Electrocuted																	**25**							14	3	42	
56 Band obtained	2																	**0**								2	2
57 Caught in fence																			**5**					2	1	8	
89 Trapped & released					1						1									**1**						3	2
96 Band only	1																				**0**					1	1
97 Miscellaneous					1		1										1					**0**				3	3
98 Band only	3	1												1									**1**	1		7	5
Total	77	50	4	12	36	1	5	29	0	2	5	6	2	49	2	4	44	0	12	1	0	0	1	69	70	481	99