

On the Misapplication of Mortality Adjustment Terms to Fatalities Missed During one Search and Found Later

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During an SRC conference call on 8 April 2008, the monitoring team said that about 40% of the carcasses other than feather piles were estimated to have been killed prior to the last search date. The significance of this figure is in the possible bias that would be introduced by misapplying searcher detection error adjustments and scavenger removal adjustments to fatalities that were missed by one or more searches. Those involved with this issue have been referring to it as “double counting,” but I think it would be more accurate to refer to it as something like misapplication of the adjustment terms. (Perhaps there is a more accurate way to refer to it, but it is not double counting of the same carcass.) Anyway, this figure of 40% did not sound correct to me, after having worked with the data. I decided to check, starting with feather spots and bones, which are the most likely candidates to introduce this bias.

Of the fatalities represented by feather spots, half (49.4%) were dated to within 30 days of discovery, another 39% were dated to 0-3 months before discovery, and 11% were dated to 1-3 months before discovery (Table 1). However, the search interval varied, so I knew that many of these estimates of days since death would have corresponded with estimated dates of death that came after the last fatality search. For example, it was not uncommon for turbine strings to experience 2 months or longer between searches, especially at the beginning of the monitoring period we used to make mortality estimates. Some of the larger numbers of days since death were likely estimated for fatalities found during searches after long intervals. Therefore, I selected the fatalities with estimated dates of death that preceded the last fatality search, which are tallied in the right-most columns of Tables 1-4. Factoring the last fatality search dates, Table 1 reveals that only 20% of the feather piles were estimated to have been older than the last fatality search. However, given how crudely the estimates of days since death have been applied to feather spots, I do not believe it is justified to conclude that any percentage of these fatalities preceded the last fatality search.

Of the fatalities represented by bones or bones and feathers, 37% were estimated to have been caused prior to the last fatality search (Table 2), but of those represented by whole carcasses, only 10% were estimated to have been caused since the last fatality search (Table 3). This latter value is only a fourth of the value cited by the monitoring team during the conference call. In Table 3 we seen that 31% of the whole carcasses were estimated to have died 60 days before discovery, and this value is certainly closer to the monitoring team’s cited value, but again, factoring in the date of the last fatality search yields a different result. Finally, of the fatalities represented by carcasses or carcass parts other than feather spots or feathers and bones, 18% were estimated to have been caused prior to the last fatality search (Table 4).

Of the fatalities (not feather spots or feather and bones) estimated to have been caused prior to the last fatality search, the average number of days between the last search and the estimated death date was 19 (Table 5). Most of these fatalities were associated with crude estimates of

days since death (30 to 90 days), so again, an average of 19 days prior to the last fatality search might have been more the result of error in estimating time since death than searcher detection error. *That is, the error implied in the estimated days since death far exceeds 19 days.*

As an additional check on the magnitude of this potential bias, I subtracted 41 days from the estimates of days since death for each fatality record (Table 6). I used 41 days to represent the average search interval when I estimated mortality based on the monitoring team's data. On average, of the fatalities that were estimated to have been caused more than 41 days before discovery, 18 days elapsed, and again, the majority (95%) of these fatalities was associated with large ranges (30 to 90 days). *The error implied by the estimated days since death far exceeded 18 days.*

I am sure that some fatalities are missed during one search but are found during a subsequent search, and that some fatalities are adjusted by incorrect searcher detection and scavenger removal values. However, based on the evidence I maintain that the influence of this error is minor. There is large uncertainty in the estimates of days since death, so I'm inclined to believe that only a few carcasses used in mortality estimates were missed once and found later.

Table 1. Days since death assigned to 631 of 653 feather spots (22 had missing values, and were omitted from table) included in mortality estimates.

Median days since death	Actual reported values	Percentage	
		All fatalities	Fatalities dated to before last search
<30	0-3, 4-8, 4-7, & 8-30 days	49.4	1.3
45	0 to 3 months	39.3	13.0
60	1 to 3 months	11.3	5.9
Total		100.0	20.1

Table 2. Days since death assigned to 133 of 135 carcasses characterized as bones or "bones and feathers" (2 had missing values, and were omitted from table) included in mortality estimates.

Median days since death	Actual reported values	Percentage	
		All fatalities	Fatalities dated to before last search
<30	4-8 & 8-30 days	25.6	0.0
60	1 to 3 months	74.4	37.0
Total		100.0	37.0

Table 3. Days since death assigned to 228 of 331 whole carcasses (103 had missing values, and were omitted from table) included in mortality estimates.

Median days since death	Actual reported values	Percentage	
		All fatalities	Fatalities dated to before last search
<30	0-3, 0-7, 4-8, 4-7, & 8-30 days	68.9	0.0
60	1 to 3 months	31.1	10.1
Total		100.0	10.1

Table 4. Days since death assigned to 964 of 1170 carcasses or carcass parts other than feather piles or bones (206 had missing values, and were omitted from table) and that were included in mortality estimates. This table includes the fatalities in Table 3.

Median days since death	Actual reported values	Percentage	
		All fatalities	Fatalities dated to before last search
<30	0-3, 4-8, 4-7, & 8-30 days	54.6	0.2
45	0 to 3 & 1 to 2 months	2.5	1.0
60	1 to 3 months	42.9	17.0
Total		100.0	18.3

Table 5. Summary of the degree to which estimated dates since death preceded the last fatality search for carcasses other than feather spots and feathers and bones. For example 10 fatalities were estimated to have occurred 45 days ago (0 to 90 days, actually), but these fatalities preceded the last fatality search by 1 to 23 days, and averaged 9 days.

Median days since death	Days since death preceding date of last fatality search			
	N	Range	Mean	SD
<30	2	5	5.00	0.00
45	10	1-23	9.00	7.83
60	164	1-60	20.07	9.60
Total	178	1-60	19.27	9.89

Table 6. Summary of the degree to which estimated dates since death preceded the average number of days since the last fatality search (41 days), which I used to estimate mortality.

Median days since death	Days since death exceeding date of last fatality search			
	N	Range	Mean	SD
45	24	4	4.00	0.00
60	414	19.0	19.0	0.00
Total	438	4-19	18.18	3.42