

American Society of Mammalogists

Correction for Sprung Traps in Catch/Effort Calculations of Trapping Results

Author(s): Lewis Nelson, Jr. and Francis W. Clark

Reviewed work(s):

Source: *Journal of Mammalogy*, Vol. 54, No. 1 (Feb., 1973), pp. 295-298

Published by: [American Society of Mammalogists](#)

Stable URL: <http://www.jstor.org/stable/1378903>

Accessed: 30/05/2012 14:16

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at

<http://www.jstor.org/page/info/about/policies/terms.jsp>

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.



American Society of Mammalogists is collaborating with JSTOR to digitize, preserve and extend access to *Journal of Mammalogy*.

<http://www.jstor.org>

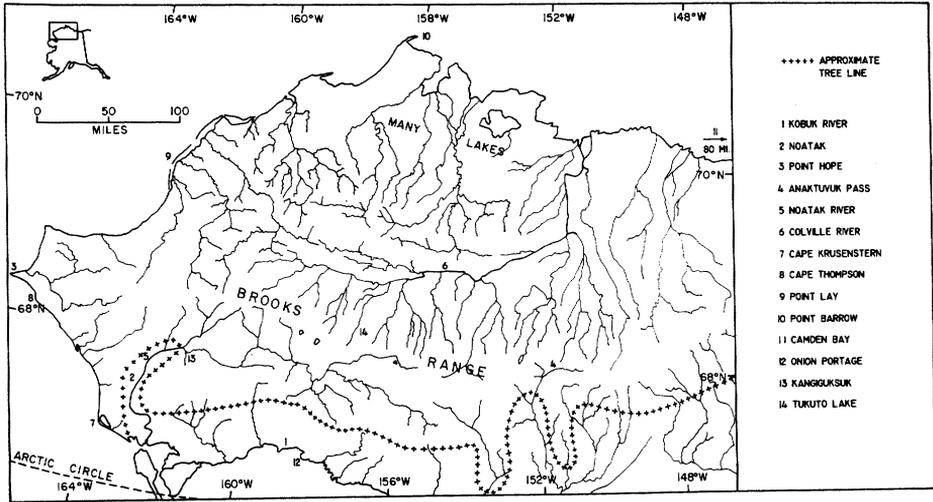


FIG. 1.—Place-names mentioned in text.

were found by a party under my direction in the upper levels of a midden at Tukuto Lake, probably dating shortly after A.D. 1800.

Explanations for the presence of moose remains at prehistoric archaeological sites in northern Alaska include trade of moose meat from more southerly areas where moose were present, periodic range extensions into northern Alaska at times in the past, or the possibility that moose have long been in the area, but in relatively few numbers. Trade seems unlikely given the conditions of the skeletal elements found (some were freshly cracked for marrow), their numbers and the body portions represented. Additionally meat was not, insofar as we know, a trade item between the Eskimos of northern Alaska and the Athapaskan Indians, who lived to the south. Either or both of the other explanations is conceivable, though I tend to believe the Eskimos' assertion, based on long familiarity with the area and its resources, that moose were not present prior to A.D. 1880 or so in the Brooks Range and not until after A.D. 1900 north of there. Whatever the case, zoologists and others seeking to explain population dynamics and range expansions of moose, at least in northern Alaska, should be cognizant of the presence of *Alces alces gigas* there before the historic period. Archaeologists interested in the dietary economy of Eskimo peoples inhabiting the area should be aware that moose were periodically available as a dietary supplement, although caribou in the interior and sea mammals along the coast undoubtedly remained the primary food source.—EDWIN S. HALL, JR., *Department of Anthropology, State University College at Brockport, Brockport, New York 14420. Accepted 20 August 1972.*

CORRECTION FOR SPRUNG TRAPS IN CATCH/EFFORT CALCULATIONS OF TRAPPING RESULTS

The term "trap-night" was first used in reference to small mammal trapping by Grinnell (1914) when describing his survey of the mammals and birds of the lower Colorado Valley. Dice (1931) discussed the merits of trapping, including the use of animals caught per trap-night, as an index of animal abundance.

TABLE 1.—Errors incurred in catch/effort studies using two equations for calculating results ($A = S$).

S	CE (%)		Difference	% Error
	Eq. (1)	Eq. (2)	$CE_2 - CE_1$	$[(CE_2 - CE_1)/CE_2] \times 100$
10	1.00	1.01	0.01	0.99
20	2.00	2.04	0.04	1.96
30	3.00	3.09	0.09	2.91
40	4.00	4.17	0.17	4.08
50	5.00	5.26	0.26	4.94
60	6.00	6.38	0.38	5.96
70	7.00	7.53	0.53	7.04
80	8.00	8.70	0.70	8.05
90	9.00	9.89	0.89	9.00
100	10.00	11.11	1.11	9.99
200	20.00	25.00	5.00	20.00
300	30.00	42.86	12.86	30.00
400	40.00	66.67	26.67	40.00
500	50.00	100.00	50.00	50.00

Kennedy (1951), and Beverton and Holt (1957) described the concept of "gear saturation" as it applied to commercial fishing. They stated that as fishing gear becomes full its fish-catching efficiency decreases and catch-per-unit-effort (catch/effort) is not necessarily representative of the population density being sampled. Beverton and Holt (1957), using long-line fishing methods, explained that fishing-gear efficiency decreases in proportion to the number of fish caught because as each unit of gear is filled it becomes disfunctional.

This principle of gear saturation should also apply to traps set for terrestrial animals. To use catch/effort as an index of animal population levels, one should account for the decrease in trapping efficiency resulting from traps being sprung, either by animals of the desired species or any other cause. This correction is necessary because as each trap is sprung it is removed from the overall trapping effort. We propose a method to correct catch/effort results to account for all traps sprung. This method is applicable to all trapping devices that become inoperative when sprung (for example, snap traps, snares, single-catch box traps, coyote getters).

Normally, Equation (1) is used for catch/effort calculations (Mech *et al.*, 1968; Van Vleck, 1969; Goertz, 1970; Shure, 1970): (1) $CE_1 = A \times 100/TU$, where CE = catch/effort (expressed in percentage trapping success or animals caught per 100 trapping units), A = number of animals captured of the desired species, P = number of trapping intervals, I = length of trapping interval, N = number of traps, and $TU = P \times I \times N$ (number of trapping units). The trapping interval is often one night and CE is frequently expressed as animals caught per trap-night.

We suggest Equation (1) be revised by subtracting half a trapping unit from the total trapping effort for each trap sprung. The revised equation becomes: (2) $CE_2 = A \times 100/(TU - IS/2)$, where S = total traps sprung by all causes. Half a trapping unit is subtracted because we assume that, on the average, each trap is sprung for half the trapping interval. This assumption can be met experimentally by adjusting the middle of the trapping interval to coincide with the peak of activity of the animals being sought.

Tables 1 and 2 demonstrate the errors incurred by using Equation (1) instead of

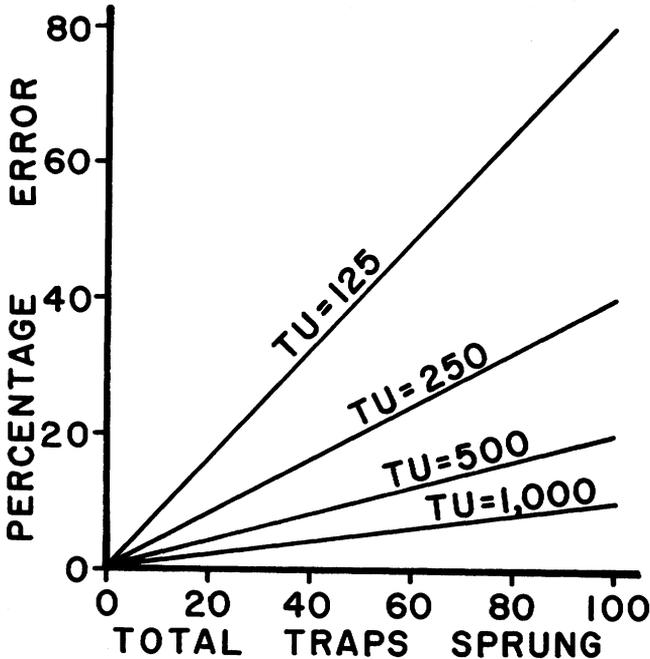


FIG. 1.—Relationship between Equation (1) errors and total traps sprung, with differing numbers of trapping units ($2A = S$, $I = 2$ days).

Equation (2). A hypothetical trapping experiment was used having 100 traps checked every 2 days for a total of 10 days. Thus, $I = 2$ days and $TU = 1000$ days ($100 \text{ traps} \times 2 \text{ days} \times 5 \text{ trapping intervals}$). In Table 1, $A = S$; i.e. the only means by which traps were sprung was by catching the animals we were seeking. In Table 2, $2A = S$ —that is, for each desired animal captured an additional trap was sprung by some other means.

The percentage difference (error) resulting from using Equation (1) instead of Equation (2) is caused by two factors, the number of animals captured of the desired species and the number of traps sprung by other causes. The first error occurs when half a trapping unit is not subtracted from the total trapping units for each animal caught of the desired species. The second occurs when half a trapping unit is not subtracted from the total trapping units for each trap sprung by some other means. Using the hypothetical example in Table 1, if $A = S = 50$, the error would be 4.94 per cent. Because $A = S$, the second error would not exist. Using the hypothetical experiment in Table 2, if $A = 50$ and $S = 100$, the error would be 10.07 per cent. A further 5.13 per cent error was incurred by the additional sprung traps. Hence, error varies with the number of animals caught of the desired species and the number of additional traps sprung by other causes, and the two errors are additive. Error is therefore greater in trapping experiments with higher catch/effort ratios and still higher in experiments that also have a high rate of traps sprung by other causes.

This error also varies with the total number of trapping units in the experiment. Fig. 1 illustrates how error increases as the number of sprung traps increases and decreases with increasing numbers of trapping units. Error is greater with fewer trapping units because a specific number of sprung traps makes up a greater proportion of the total

TABLE 2.—Errors incurred in catch/effort studies using two equations for calculating results ($2A = S$).

A	S	CE (%)		Difference $CE_2 - CE_1$	% Error [[$(CE_2 - CE_1)/CE_2$] × 100]
		Eq. (1)	Eq. (2)		
10	20	1.00	1.02	0.02	1.96
20	40	2.00	2.08	0.08	3.85
30	60	3.00	3.19	0.19	5.96
40	80	4.00	4.35	0.35	8.05
50	100	5.00	5.56	0.56	10.07
60	120	6.00	6.82	0.82	12.02
70	140	7.00	8.14	1.14	14.00
80	160	8.00	9.52	1.52	15.97
90	180	9.00	10.98	1.98	18.03
100	200	10.00	12.50	2.50	20.00
200	400	20.00	33.33	13.33	39.99
250	500	25.00	50.00	25.00	50.00

traps in experiments with fewer total trapping units. The effect is diluted in larger numbers of trapping units.

The practical value of this method is to improve the accuracy of catch/effort calculations so that population estimates and comparisons between trapping experiments will be more valid. We want to stress the differences in catch/effort results caused by ignoring the loss in active trapping time due to traps that catch what they are set for as well as traps sprung by other causes. Differences of this magnitude could obscure true similarities or differences in population indices between two or more animal populations or within a single population at different times.

This research was supported in part by grants from the Atomic Energy Commission (AT(11-1)-1329) and U. S. Bureau of Sport Fisheries and Wildlife, Research Division.

LITERATURE CITED

- BEVERTON, R. J. H., AND S. J. HOLT. 1957. On the dynamics of exploited fish populations. United Kingdom Ministry Agric. and Fish., Fish. Invest., ser. 2, 19:1-533.
- DICE, L. R. 1931. Methods of indicating the abundance of mammals. *J. Mamm.*, 12: 376-381.
- GOERTZ, J. W. 1970. An ecological study of *Neotoma floridana* in Oklahoma. *J. Mamm.*, 51:94-104.
- GRINNELL, J. 1914. A survey of the mammals of the lower Colorado Valley. *Univ. California Pub. Zool.*, 12:1-92.
- KENNEDY, W. A. 1951. The relationship of fishing effort by gill nets to the interval between lifts. *J. Fish. Res. Bd. Canada*, 8:264-274.
- MECH, L., D. M. BARNES, AND J. R. TESTER. 1968. Seasonal weight changes, mortality, and population structure of raccoons in Minnesota. *J. Mamm.*, 49:63-73.
- SHURE, D. J. 1970. Ecological relationships of small mammals in a New Jersey barrier beach habitat. *J. Mamm.*, 51:267-278.
- VAN VLECK, D. B. 1969. Standardization of *Microtus* home-range calculation. *J. Mamm.*, 50:69-80.

LEWIS NELSON, JR., AND FRANCIS W. CLARK, *Department of Animal Physiology, University of California, Davis, 95616, and deceased. Accepted 20 August 1972.*