NOAA Technical Memorandum
NMFS-SEFC-164

Patterns and variability in First-year Growth in Weight of Captive-reared Kemp's Ridley Sea Turtle: a Graphical Analysis

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INTRODUCTION

While conducting statistical analyses and preparing graphs for the paper by Caillouet et al.[1/] on growth of six year-classes (1978-1983) of captive-reared Kemp's ridley sea turtle, Lepidochelys kempi, we prepared the graphs in this technical memorandum. They were too numerous to include in a journal article, so we reproduced them herein. The turtles were reared as part of the Kemp's ridley sea turtle head start research project (Klima and McVey, 1981; Caillouet, 1984; Fontaine et al., 1985).

METHODS

For details concerning rearing methods, sampling to determine weights, etc., the reader is referred to Caillouet et al.[1/] and Fontaine et al. (1985).

The graphs depict the geometric mean weight (shown either by unconnected short horizontal lines for the 1978-1980 year-classes or connected by solid lines for the 1981-1983 year-classes) and ranges in weight (vertical lines) of samples of turtles by "imprint"-group (i.e., turtles "imprinted" at PINS = Padre Island National Seashore near Corpus Christi, Texas, and at RN = Rancho Nuevo, Mexico) within the 1978-1980 year-classes and by clutch number within the 1981-1983 year-classes. The geometric mean was calculated as the antilog of the mean of logarithmically transformed sample weights. The time-course of survival (%; dashed line) also is shown for clutches of the 1981-1983 year-classes.

This paper includes two graphs each for the 1978-1980 year-classes, 23 for the 1981 year-class, 20 for the 1982 year-class, and three for the 1983 year-class.

1/ Caillouet, C. W., Jr., D. B. Koi, C. T. Fontaine, T. D. Williams, W. J. Browning and R. M. Harris. Growth and survival of Kemp's ridley sea turtle, Lepidochelys kempi, in captivity. Manuscript submitted to the editor, Chelonian Documentation Center Bulletin.

The legend above each graph gives the year-class and either the "imprint"-group (PINS or RN) or the clutch number. For clutches in year-classes 1981-1983, the initial number of hatchlings in each clutch is given in parentheses after the clutch number.

RESULTS

The graphs show the following with regard to growth in weight (kg) of Kemp's ridley:

1. Variability was heterogeneous; i.e., variability among individual turtles, as shown by the ranges, increased with age in days (1981-1983 year-classes) or lapsed time in days (when age was unknown; 1978-1980 year-classes).

2. Variability was greater within year-classes 1978-1980 than within year-classes 1981-1983. This primarily was a consequence of differences in sampling methods.

3. Growth slowed near the middle of the head starting period and resumed thereafter, probably due to decrease in temperature during winter.

4. Slower growth seemed linked to lower survival and vice versa for clutches of the 1981-1983 year-classes.

5. Growth was most rapid in the 1980 year-class and slowest in the 1983 year-class.

DISCUSSION

For details concerning interpretation, the reader is referred to Caillouet et al.1/.

ACKNOWLEDGMENTS

Special thanks are due René Márquez Millán (Instituto Nacional de la Pesca, Mexico), Jack Woody and David Bowman (U.S. Fish and Wildlife Service, Albuquerque, New Mexico), Milford Fletcher (National Park Service, Santa Fe, New Mexico), Patrick Burchfield (Gladys Porter Zoo, Brownsville, Texas), and Robert King (National Park Service, Corpus Christi, Texas), their staffs and their predecessors, for their respective roles in providing Kemp's ridley hatchlings for head starting.

Head starting of the 1978-1983 year-classes of Kemp's ridley was conducted under consecutive permits no. ABC-IV-0751/8676, ABC-IV-1258/4287, 242-0180-3794, 242.2-2610, 242.2-00026/1147 and CG-115-900 (and Mexican Diplomatic Note no. 316502) issued by Mexico's Instituto Nacional de la Pesca, under U.S. Fish and Wildlife Service Endangered and Threatened Species Permits no. PRT 2-1770, PRT 2-4481 and PRT-676379, and under scientific permits issued by the Texas Parks and Wildlife Department and Florida Department of Natural Resources.

The authors are grateful to Edward F. Klima, James P. McVey and Ray S. Wheeler, Clark T. Fontaine, Jorge K. Leong, and their staffs for their roles in sea turtle head starting at the Galveston Laboratory.

Dickie Revera and Marcel Duronslet assisted in checking, verifying and validating some of the data used in our graphs. Bea Richardson typed the manuscript.

Carole Allen, Chairperson of HEART (Help Endangered Animals-Ridley Turtles), Piney Woods Wildlife Society, North Harris County College, Houston, Texas, and the members of HEART have increased public awareness and support of the Kemp's ridley head start research project as well as for sea turtle conservation in general. For their efforts, we are especially grateful.

LITERATURE CITED

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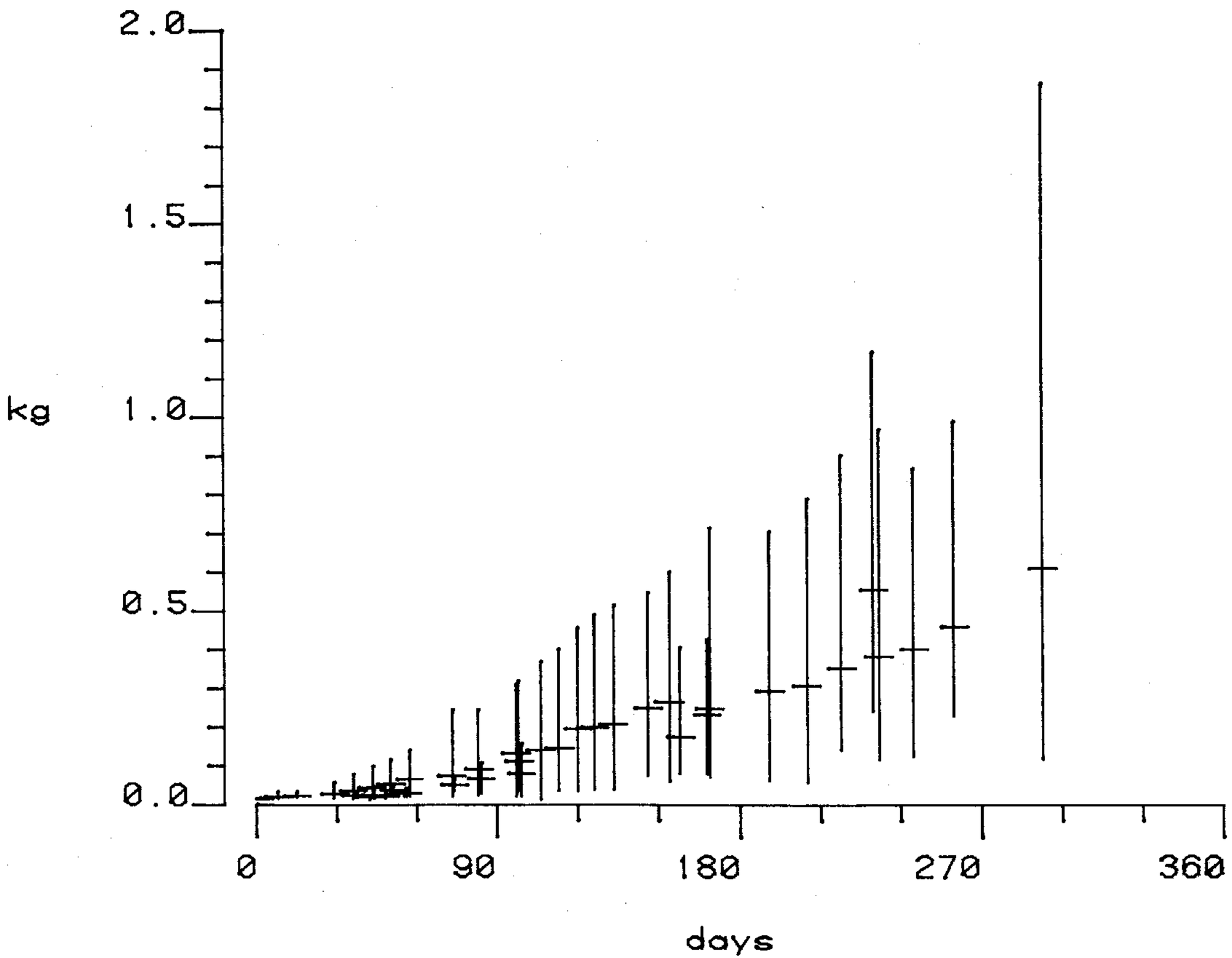
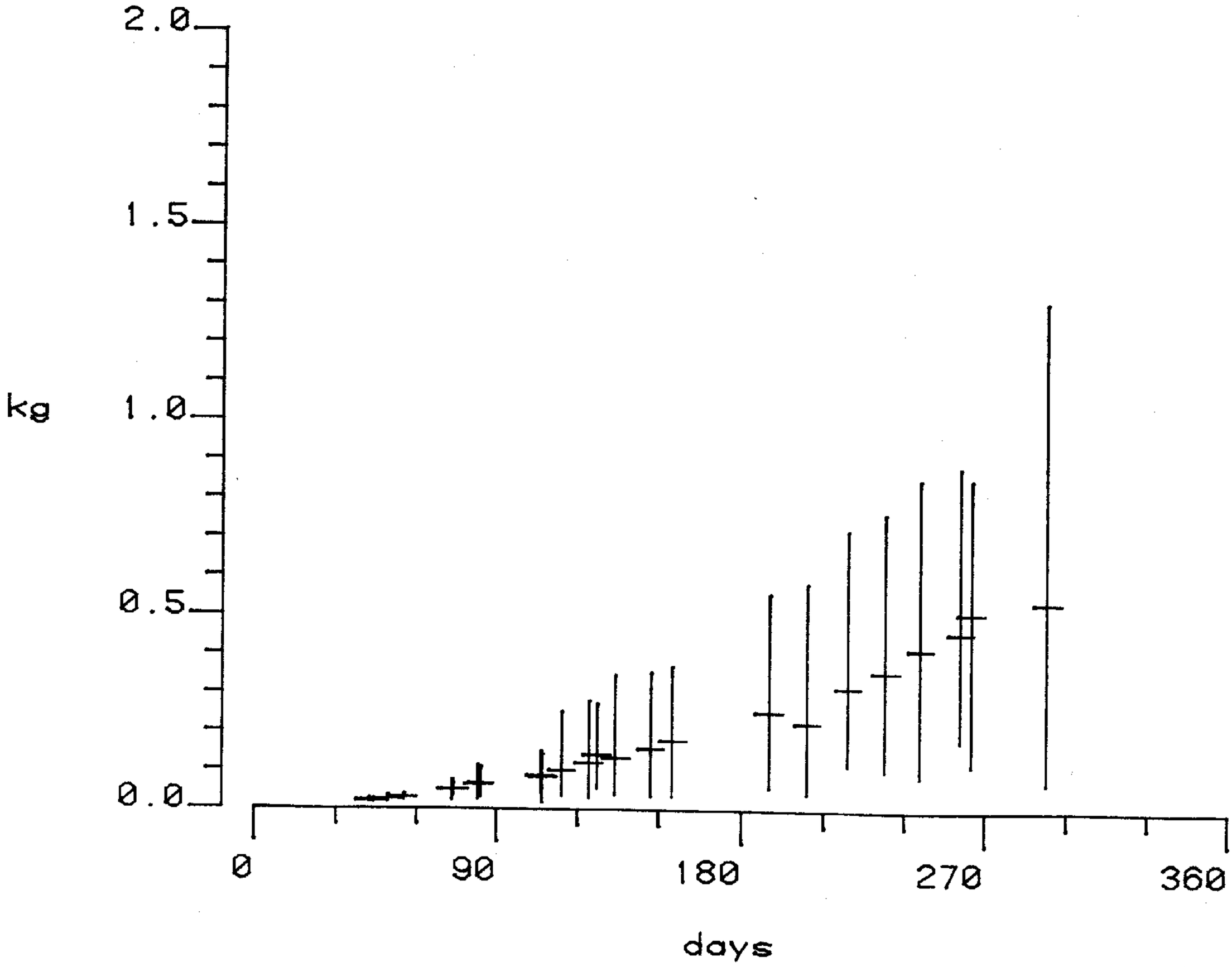
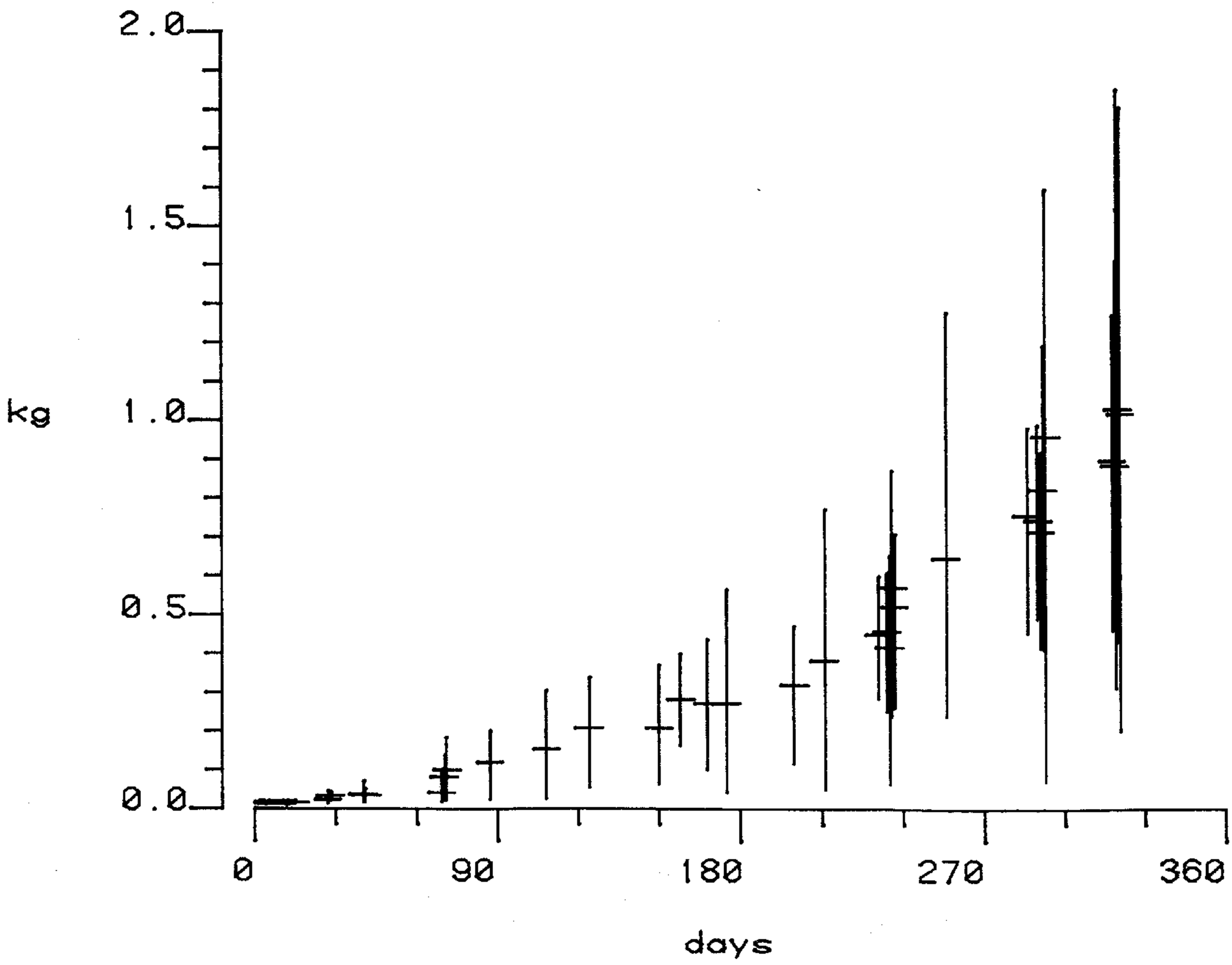
Fontaine, C. T., K. T. Marvin, T. D. Williams, W. J. Browning, R. M. Harris, K. L. W. Indelicato, G. A. Shattuck and R. A. Sadler. 1985. The husbandry of hatchling to yearling Kemp's ridley sea turtles, Lepidochelys kempi. NOAA Technical Memorandum NMFS-SEFC-158, iii plus 34 p., 10 tables, 22 figures and 2 appendices.

Klima, E. F. and J. P. McVey. 1981. Headstarting the Kemp's ridley turtle, Lepidochelys kempi, p. 481-487. In: Bjorndal, Karen A. (ed.), Biology and Conservation of Sea Turtles, Smithsonian Inst. Press, Wash., D.C., 583 p.

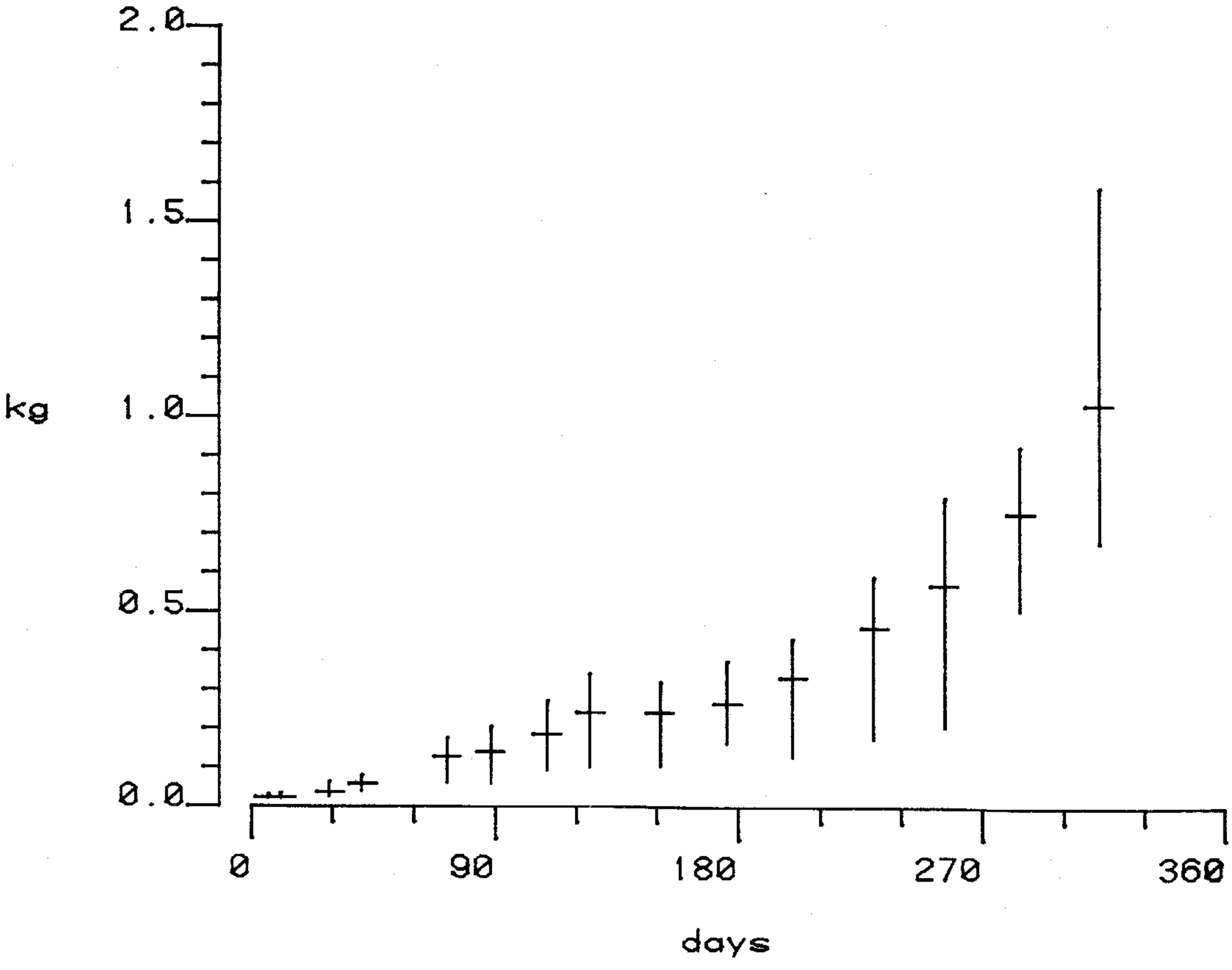

1978 YEAR-CLASS PINS
2.0
1.5
1.0
0.5
0.0
kg
0
90
180
270
360
days

1978 YEAR-CLASS RN

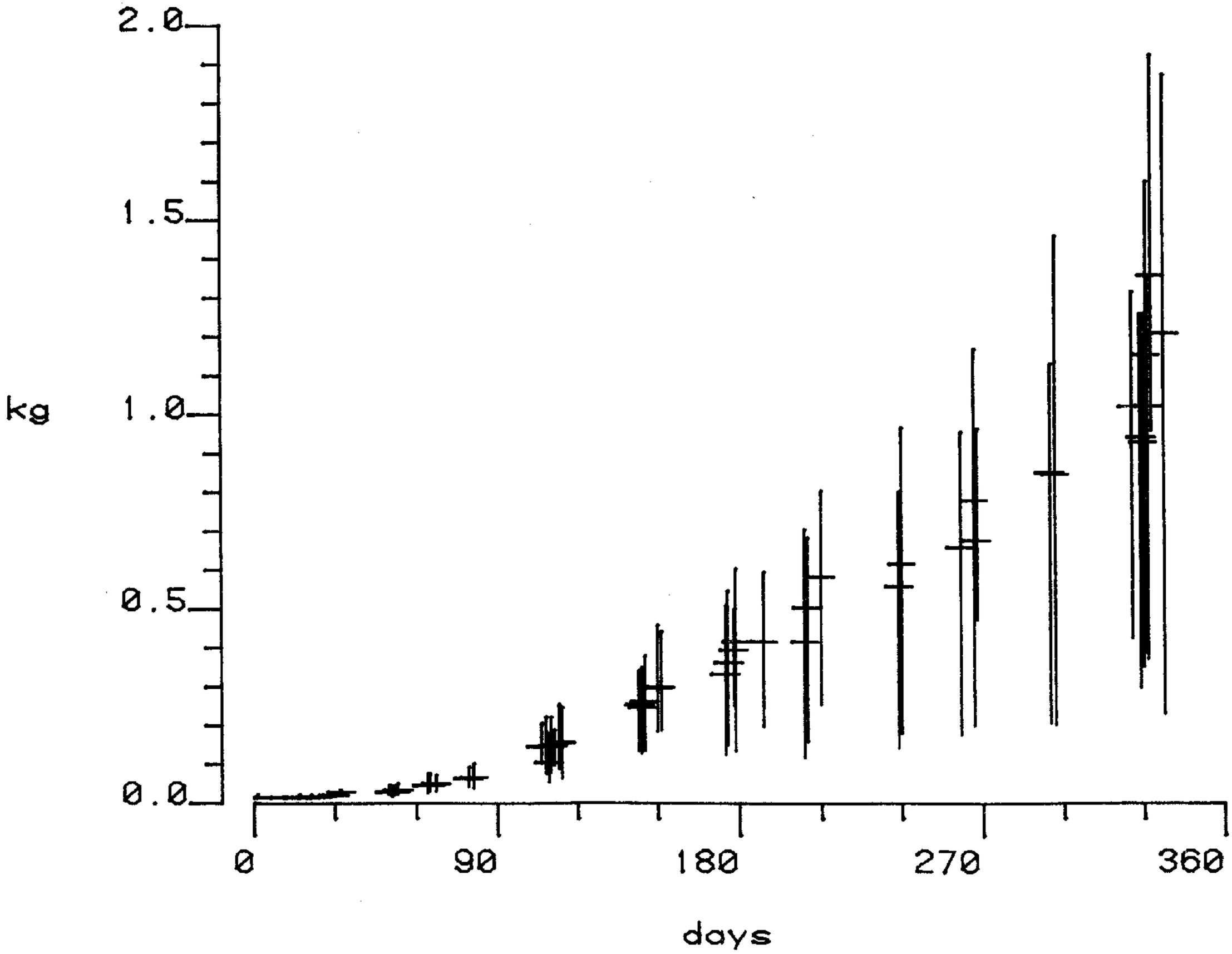


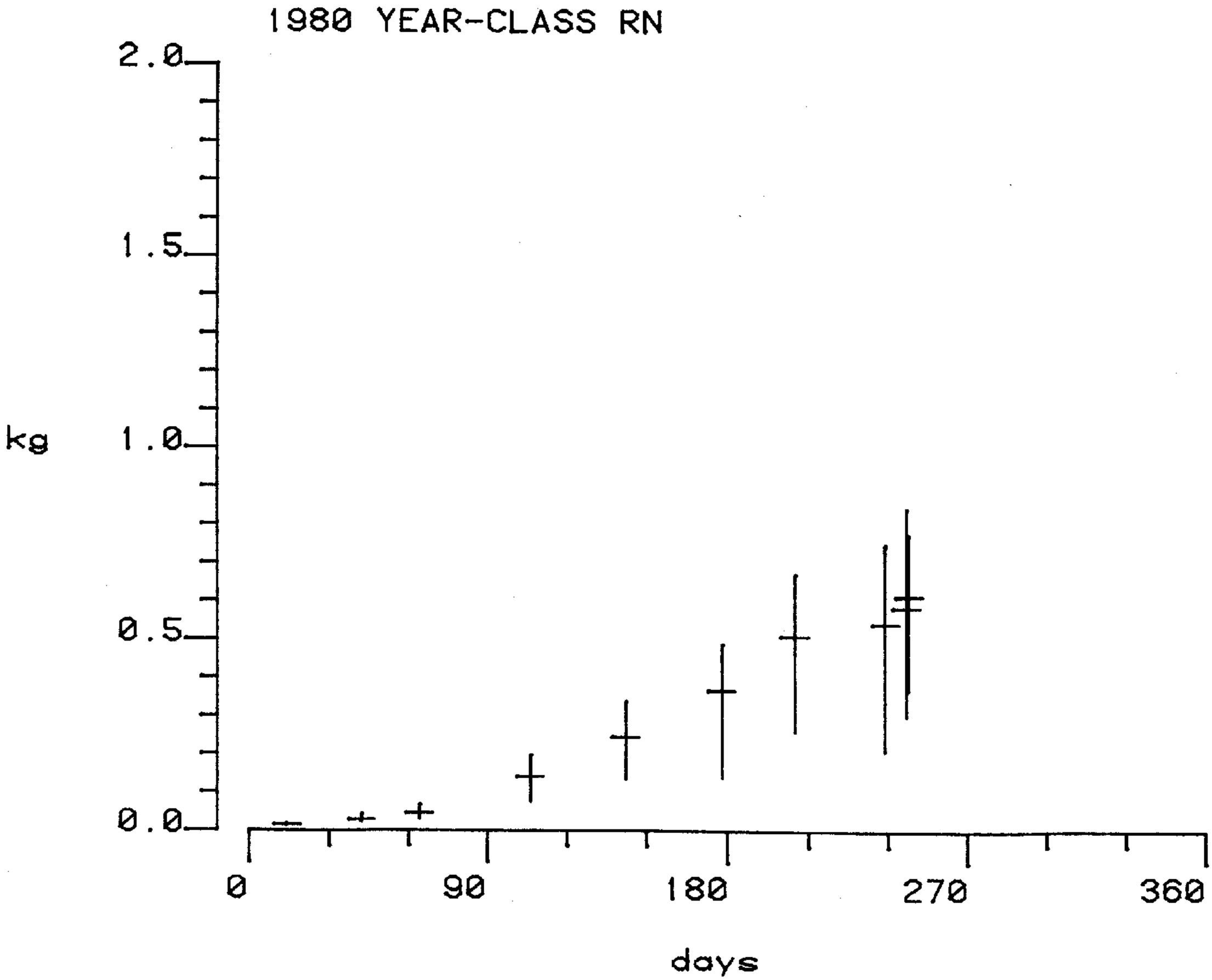

1979 YEAR-CLASS PINS
kg
2.0
1.5
1.0
0.5
0.0
0
90
180
270
360
days

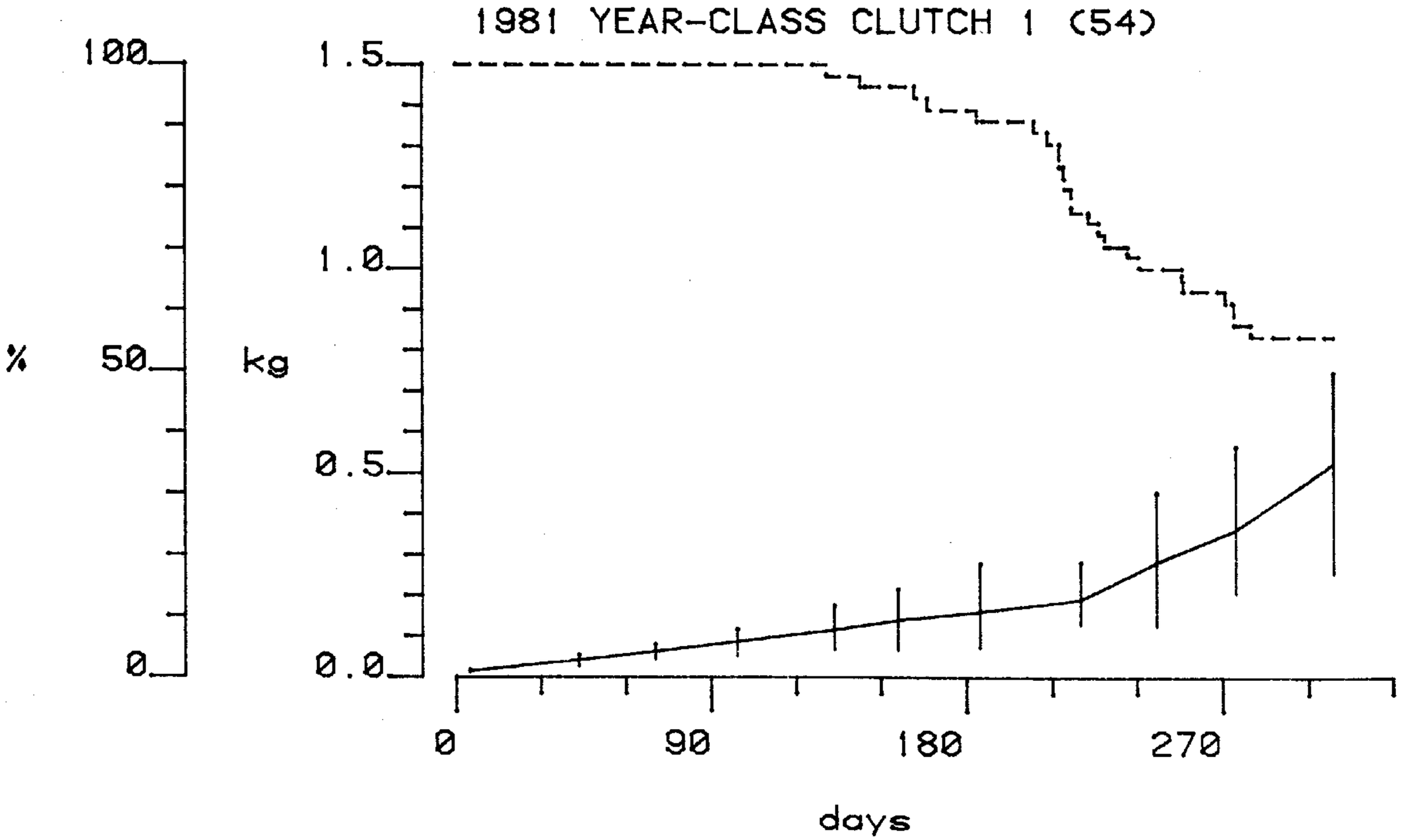
1979 YEAR-CLASS RN

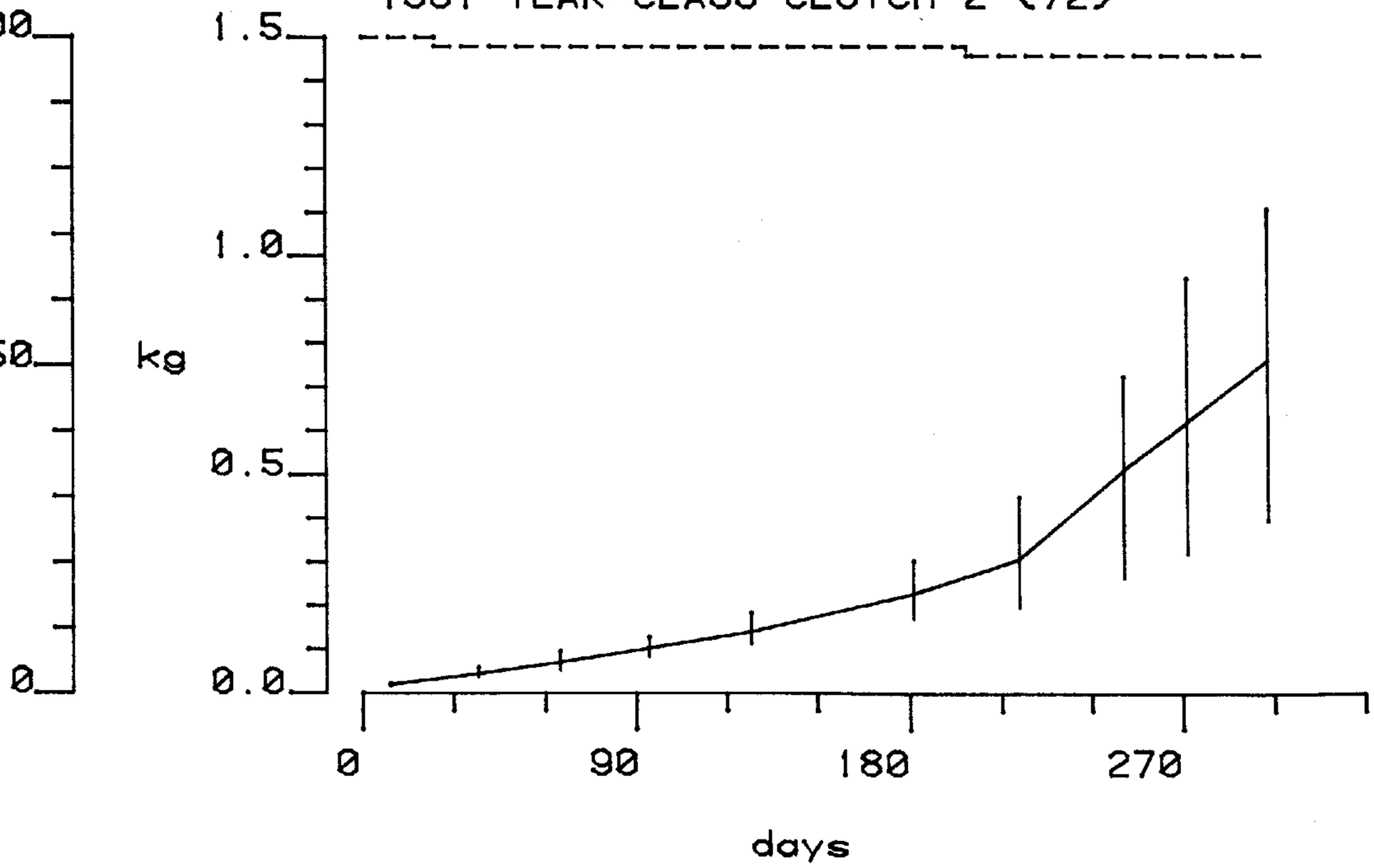


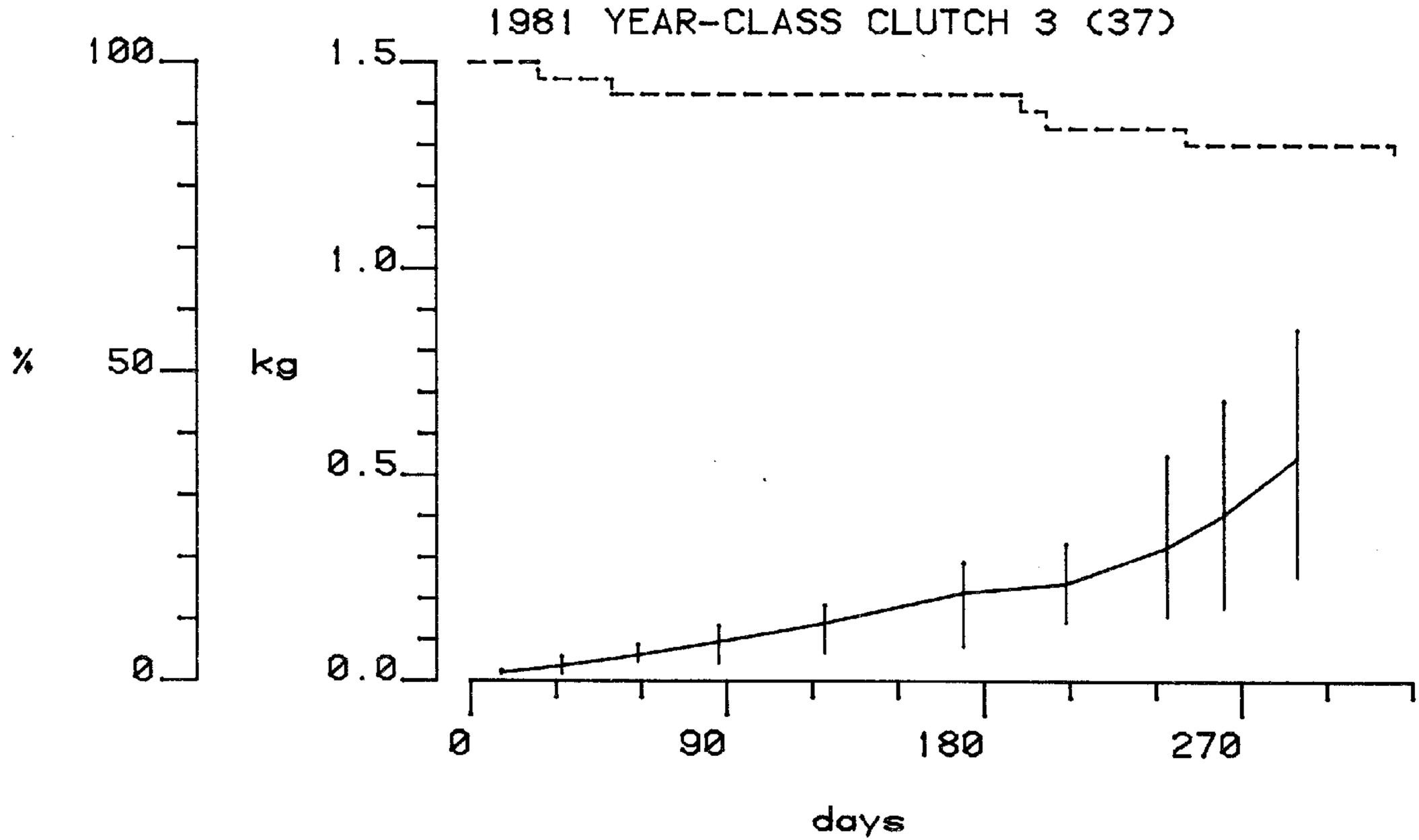
1980 YEAR-CLASS PINS

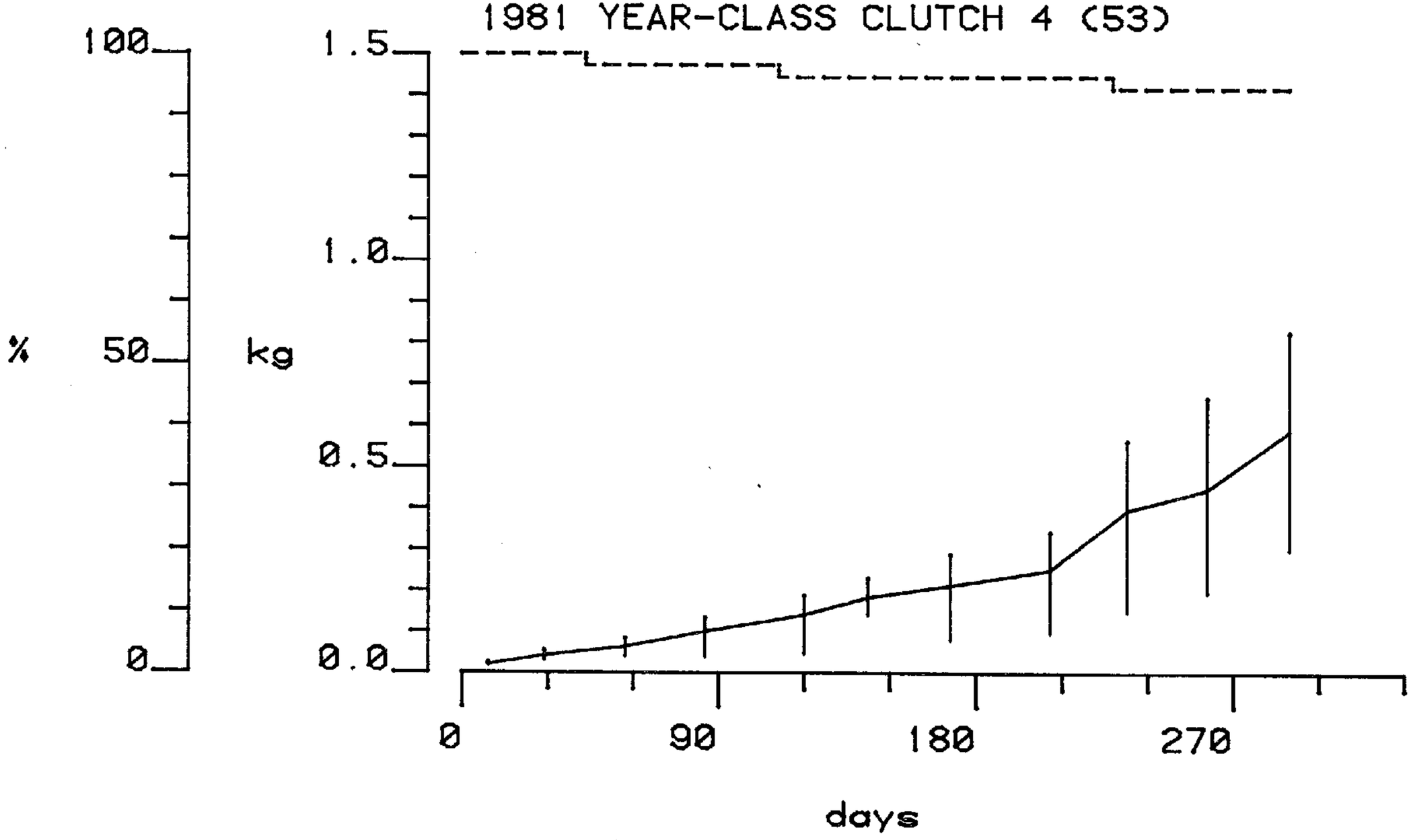


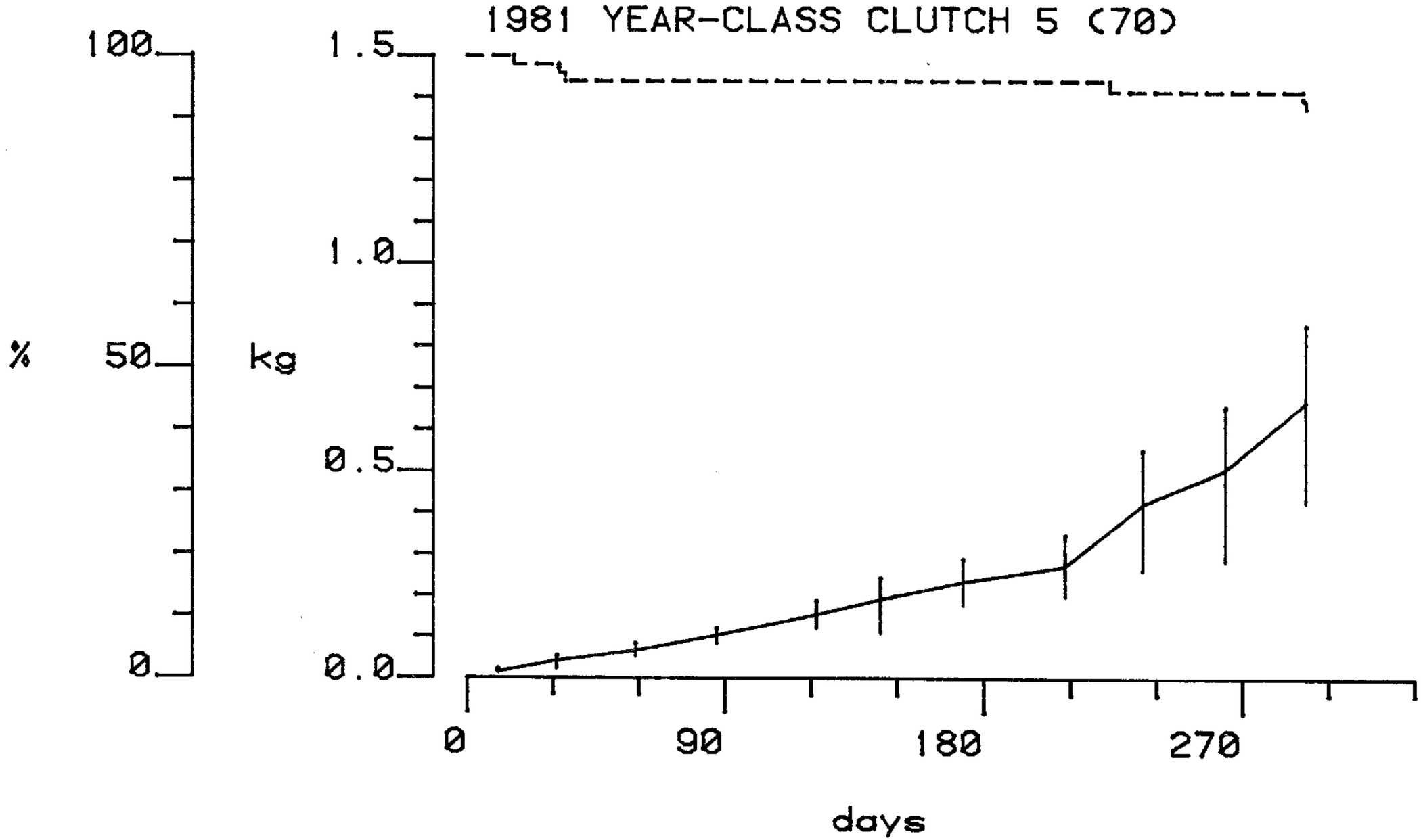

1980 YEAR-CLASS RN
kg
2.0
1.5
1.0
0.5
0.0
0
90
180
270
360
days

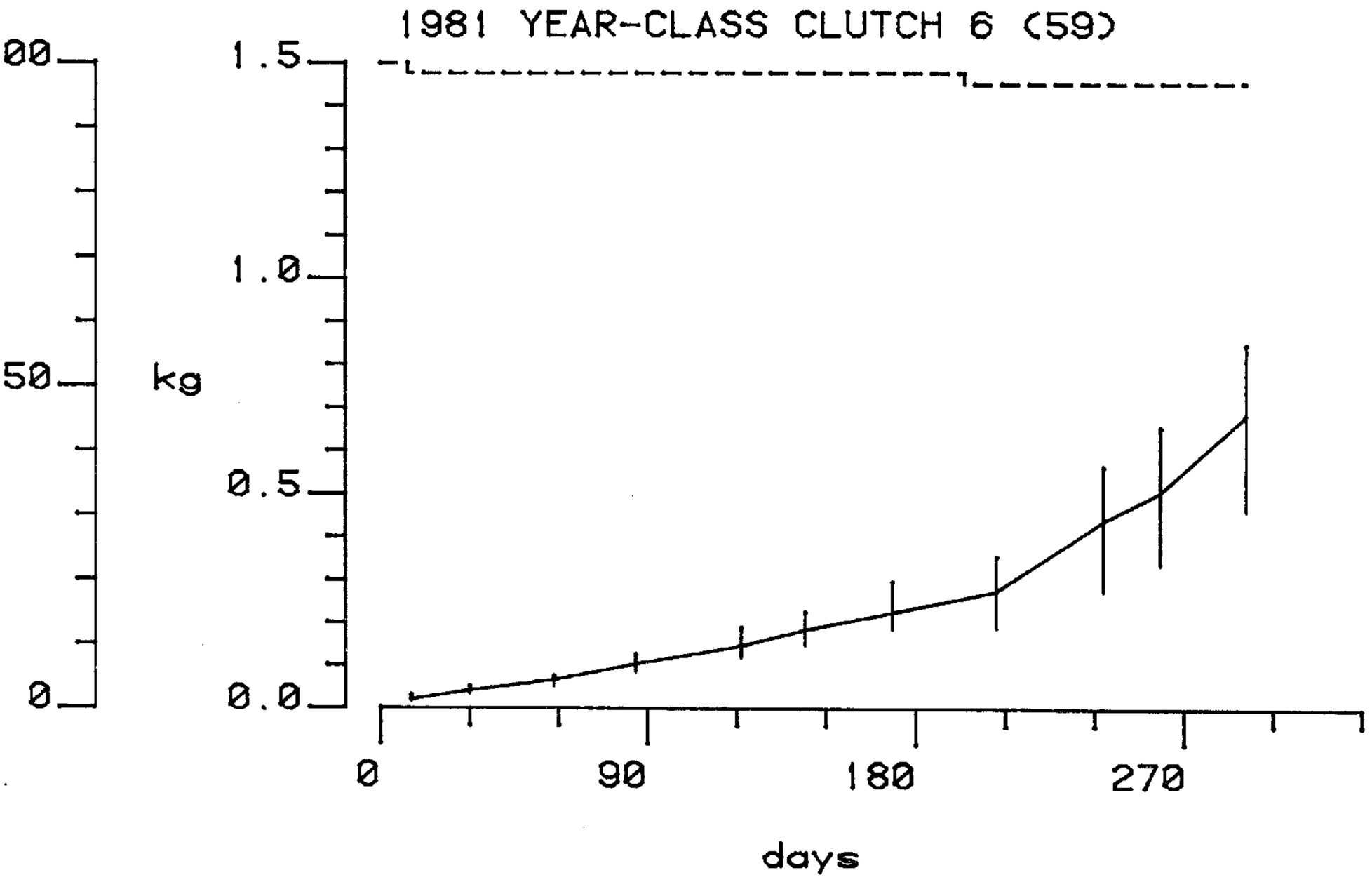

1981 YEAR-CLASS CLUTCH 1 (54)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

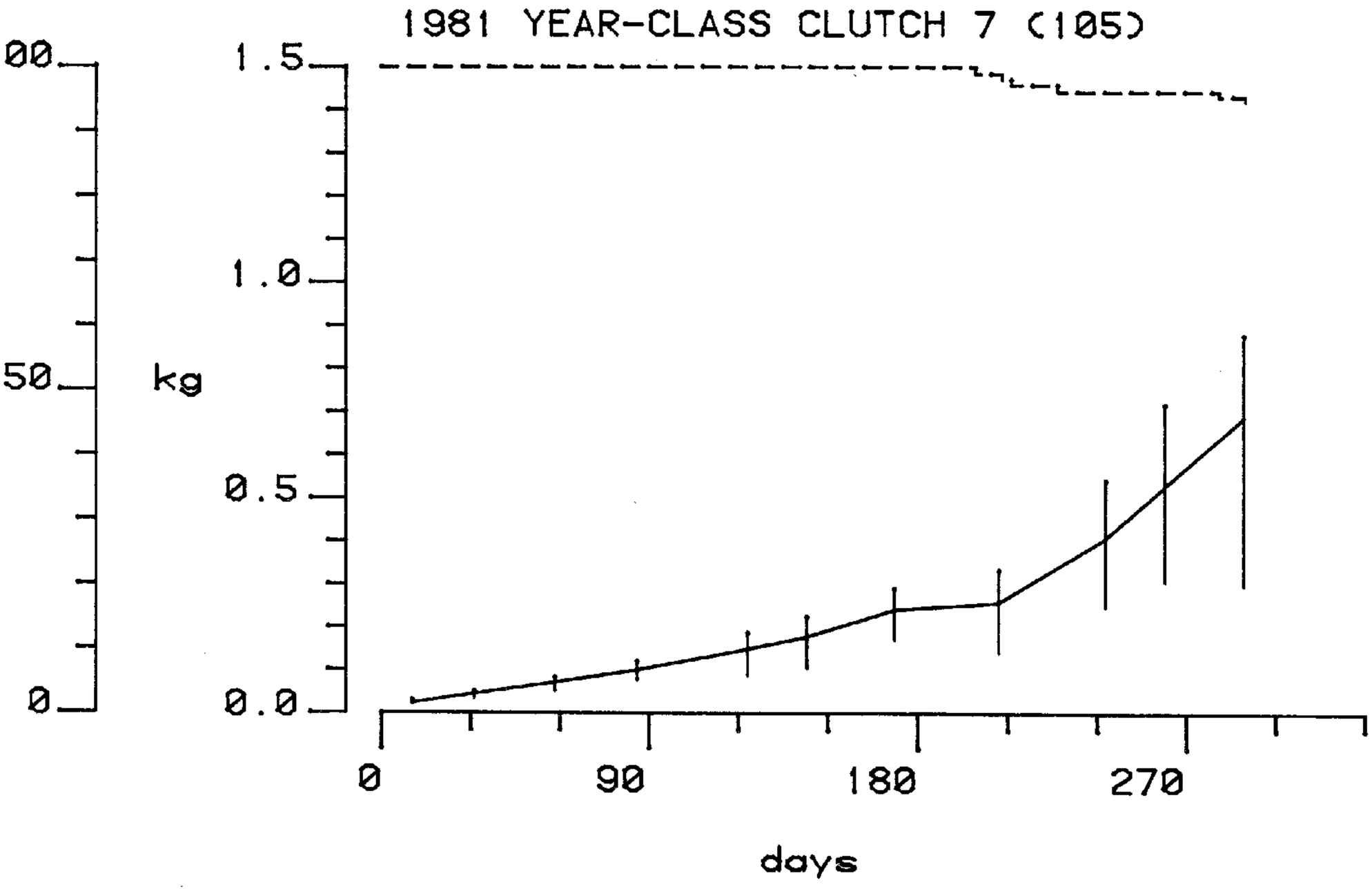

1981 YEAR-CLASS CLUTCH 2 (72)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

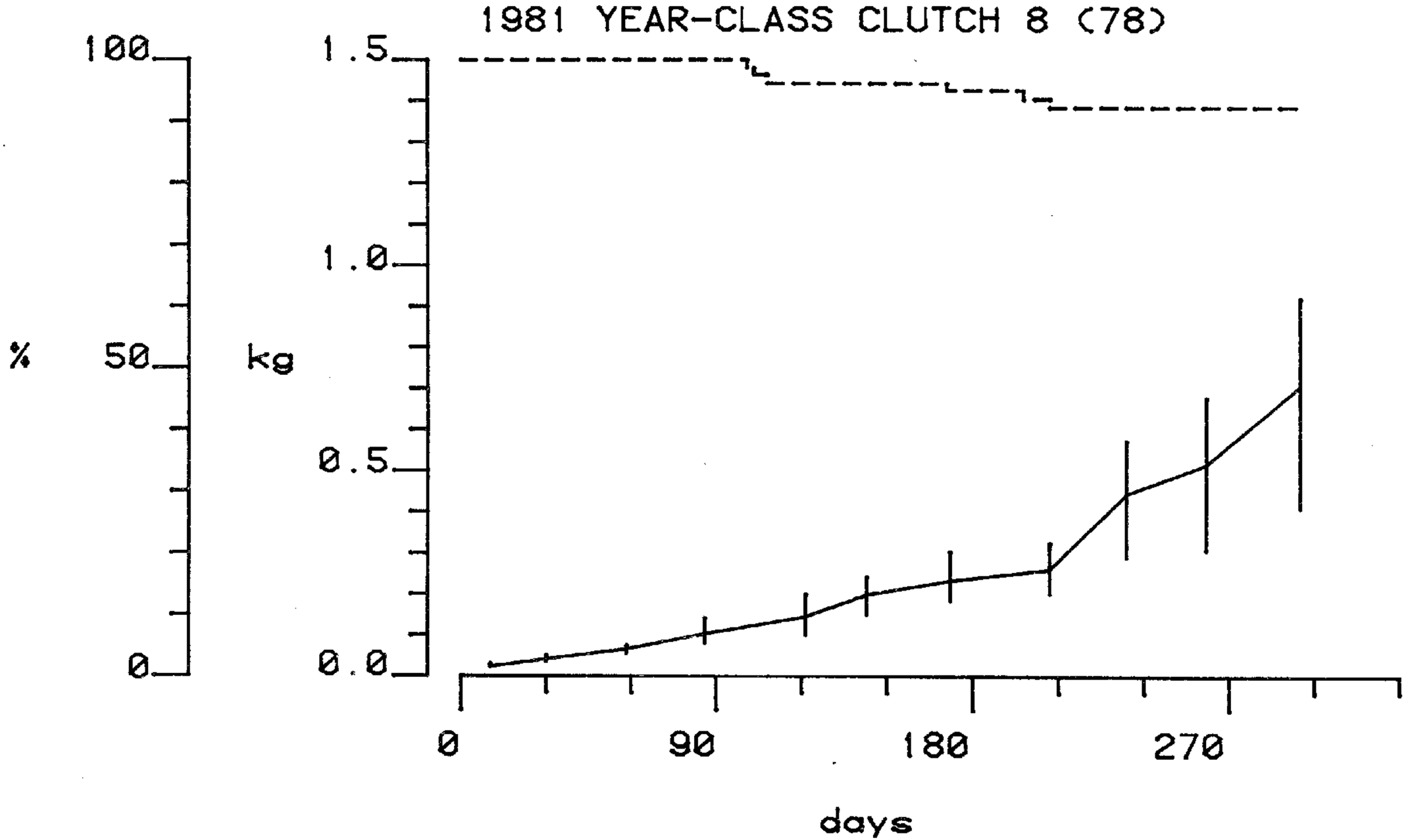

1981 YEAR-CLASS CLUTCH 3 (37)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

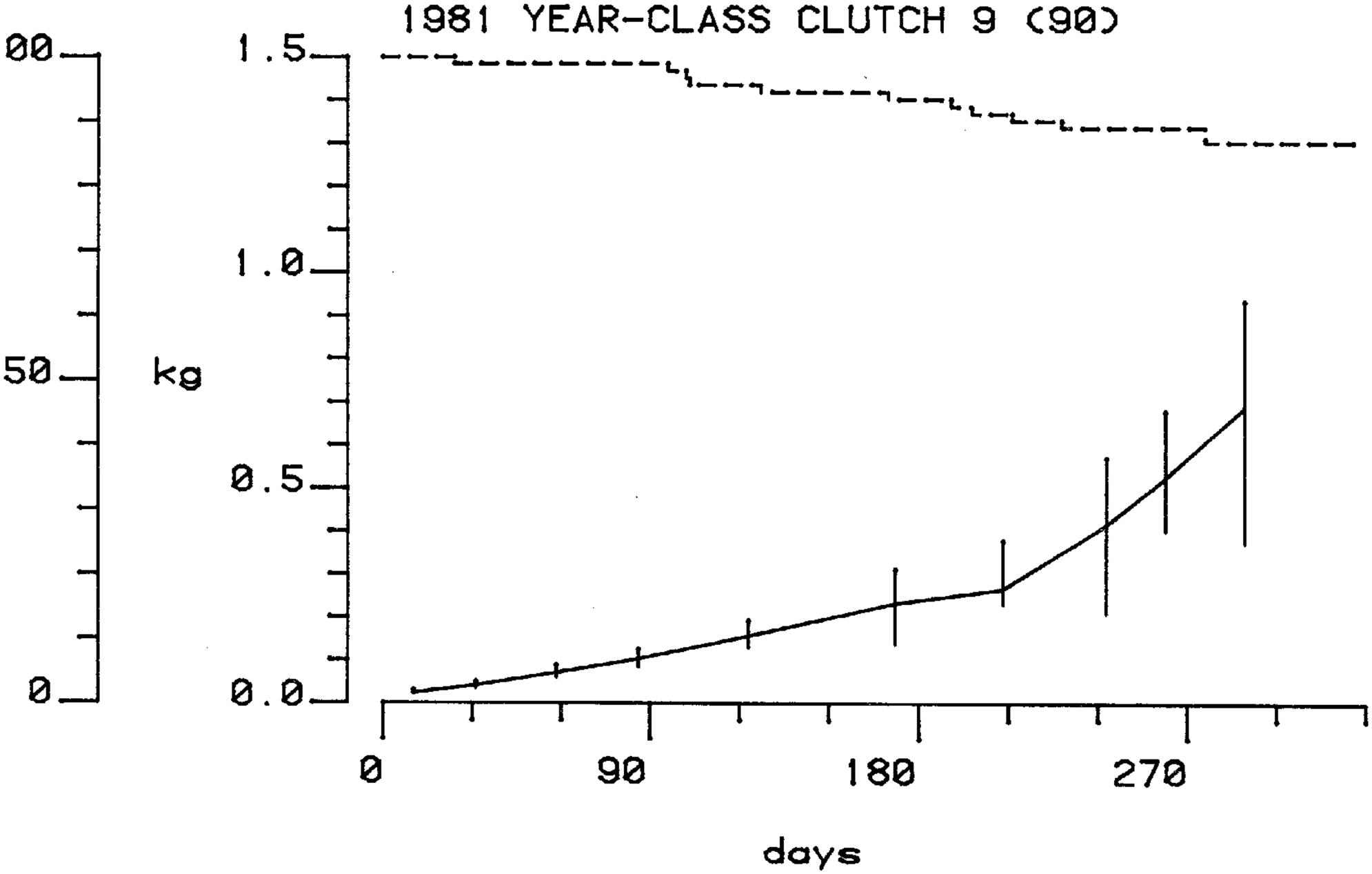

1981 YEAR-CLASS CLUTCH 4 (53)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

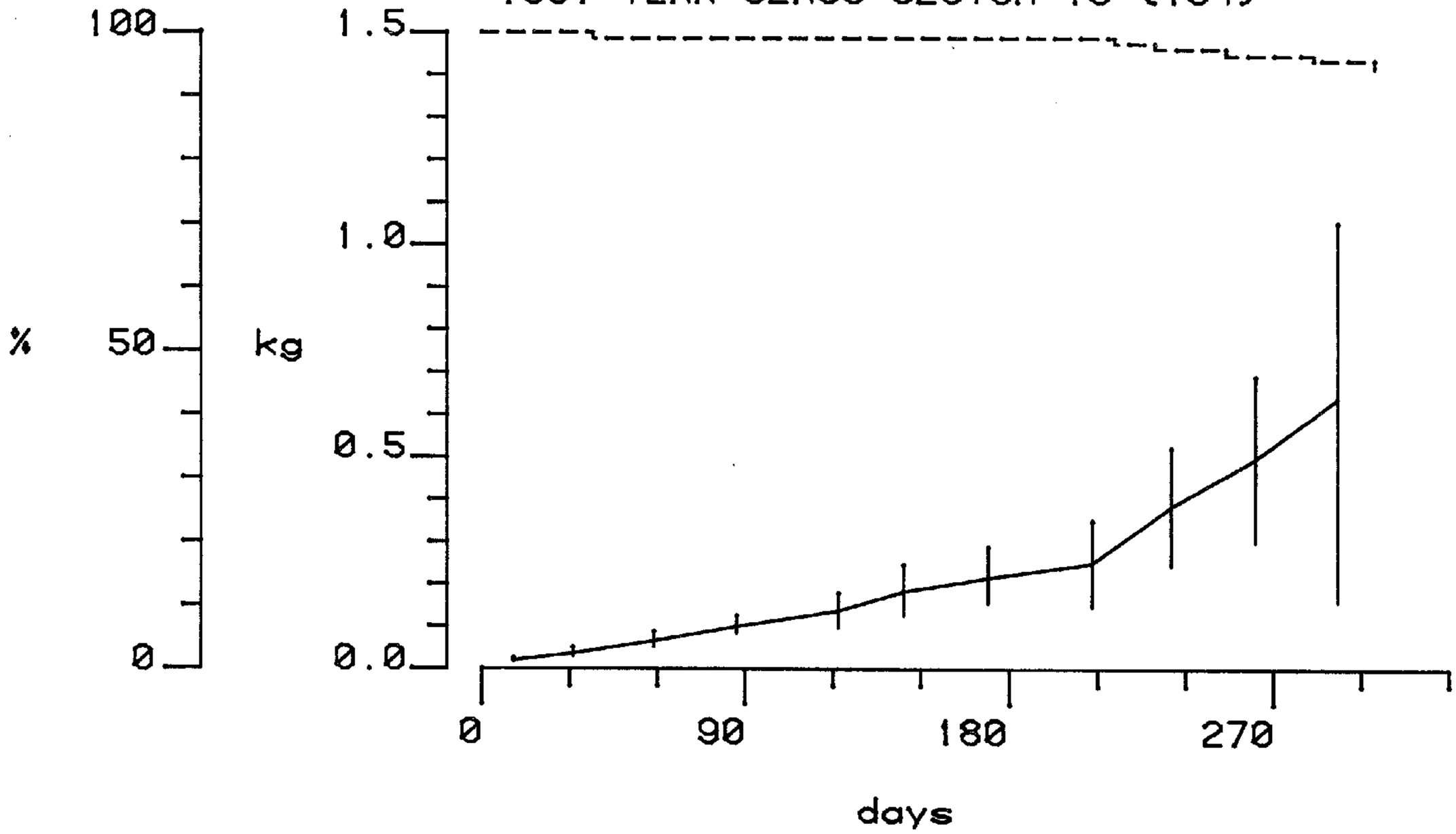

1981 YEAR-CLASS CLUTCH 5 (70)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

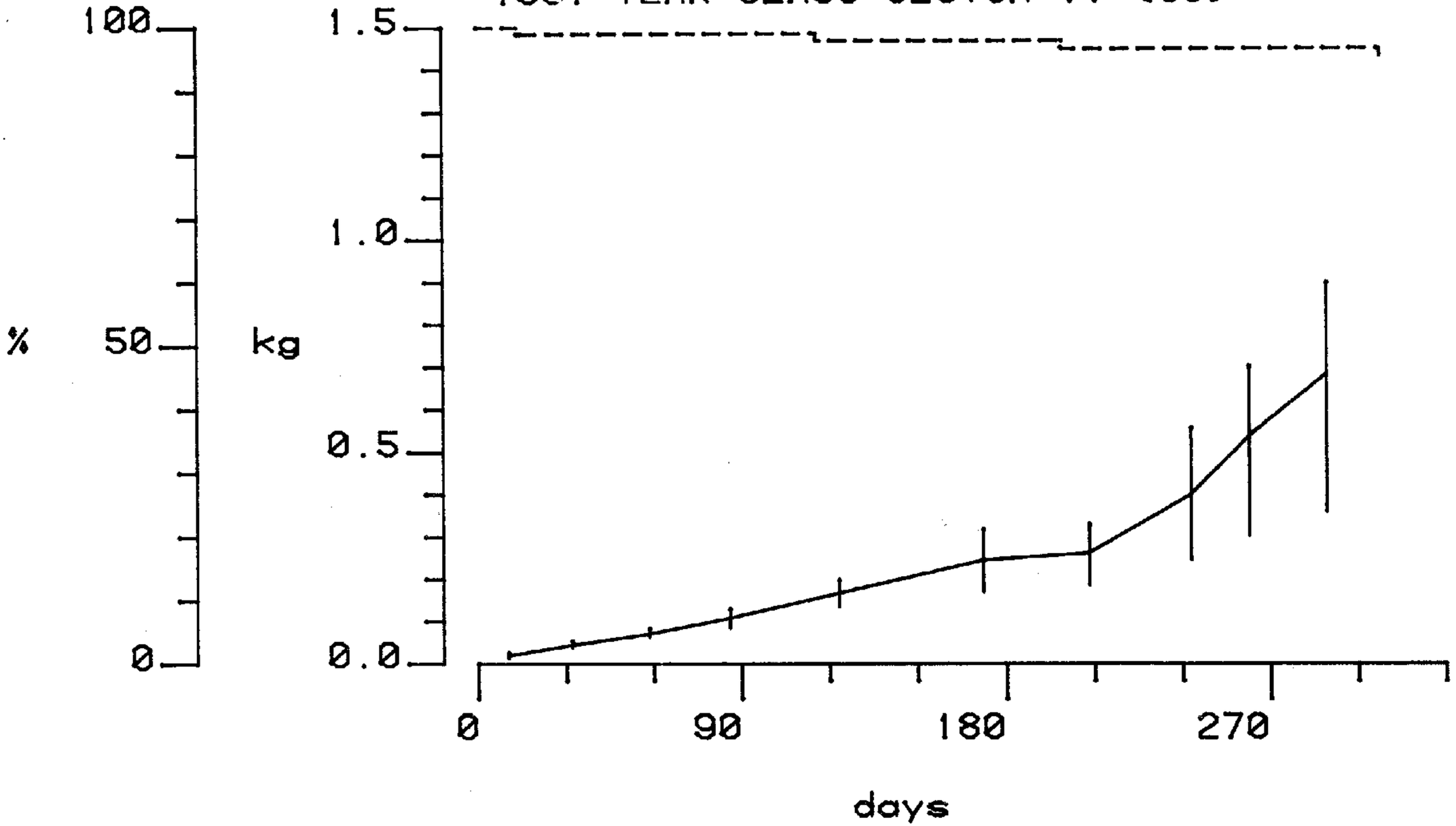

1981 YEAR-CLASS CLUTCH 6 (59)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

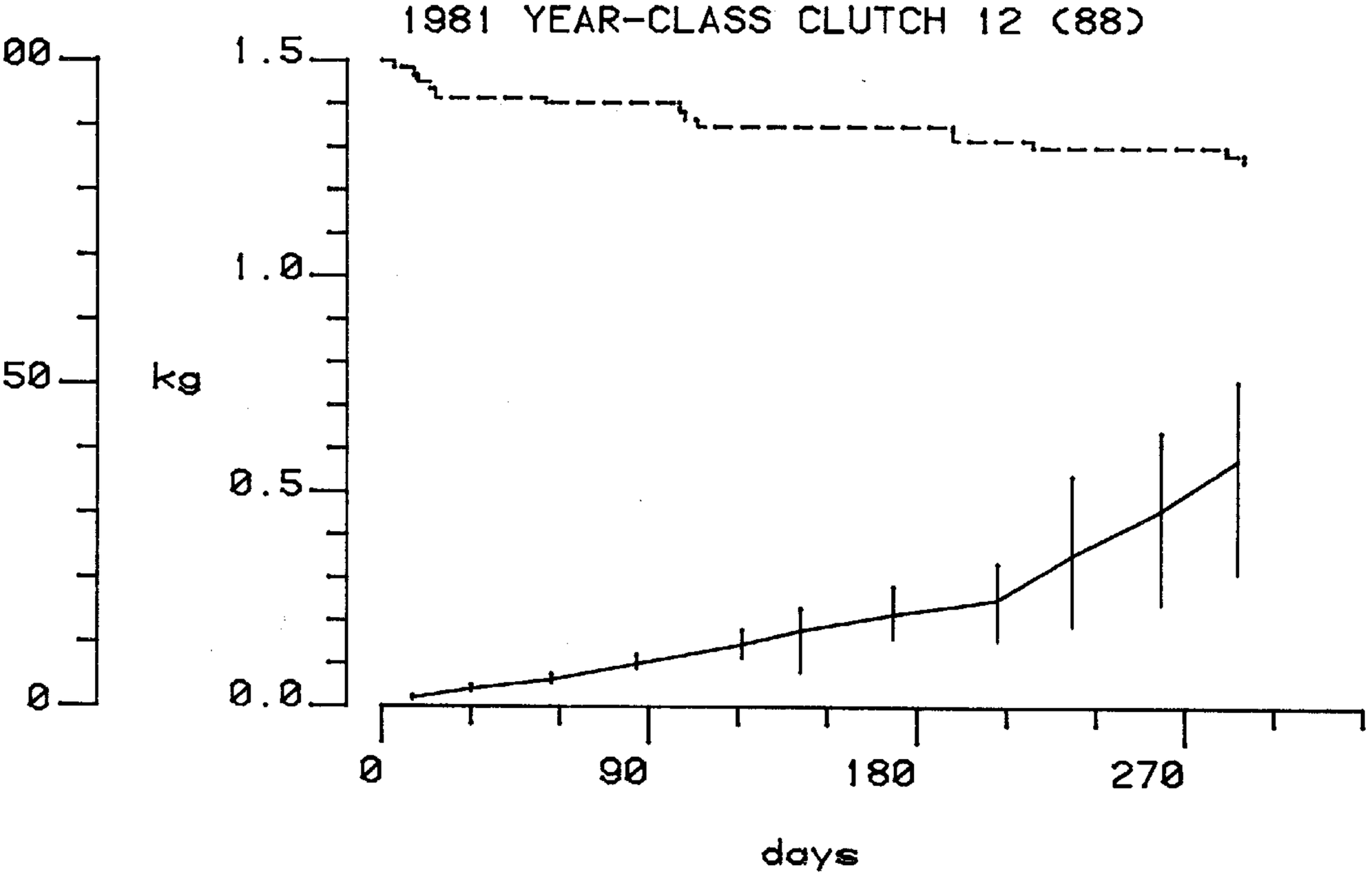

1981 YEAR-CLASS CLUTCH 7 (105)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

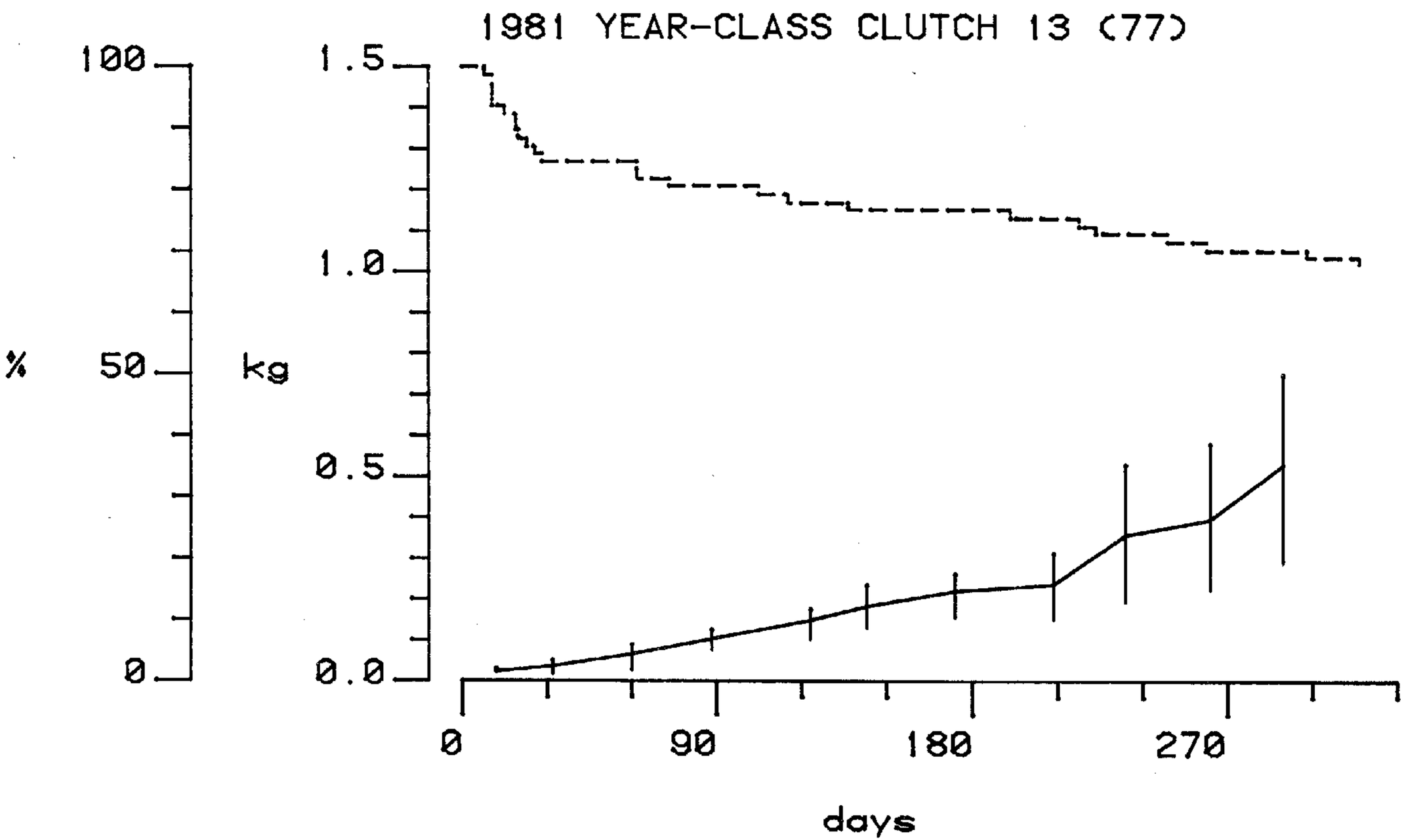

1981 YEAR-CLASS CLUTCH 8 (78)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days


1981 YEAR-CLASS CLUTCH 9 (90)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days


1981 YEAR-CLASS CLUTCH 10 (104)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days


1981 YEAR-CLASS CLUTCH 11 (86)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days


1981 YEAR-CLASS CLUTCH 12 (88)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days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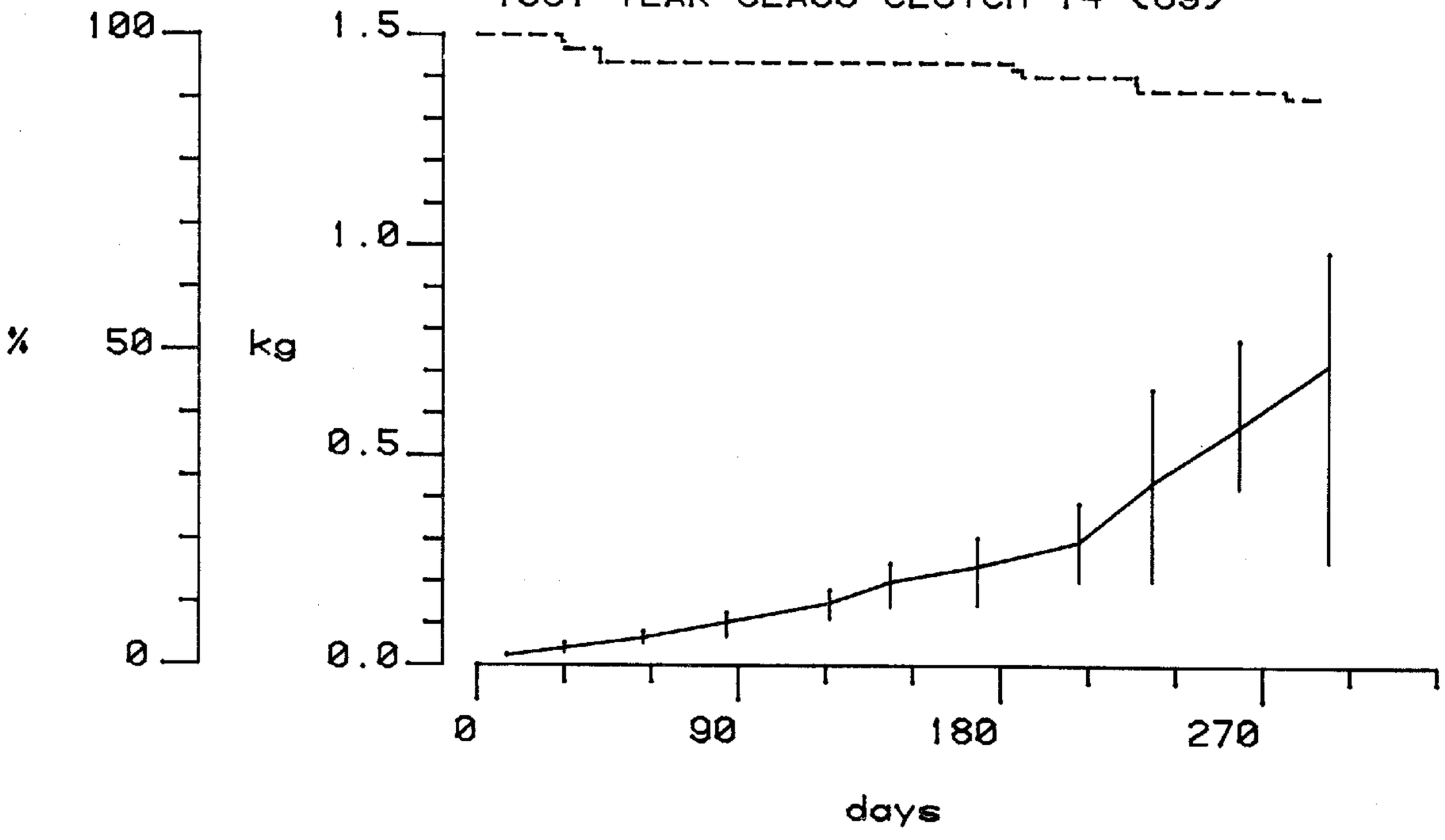
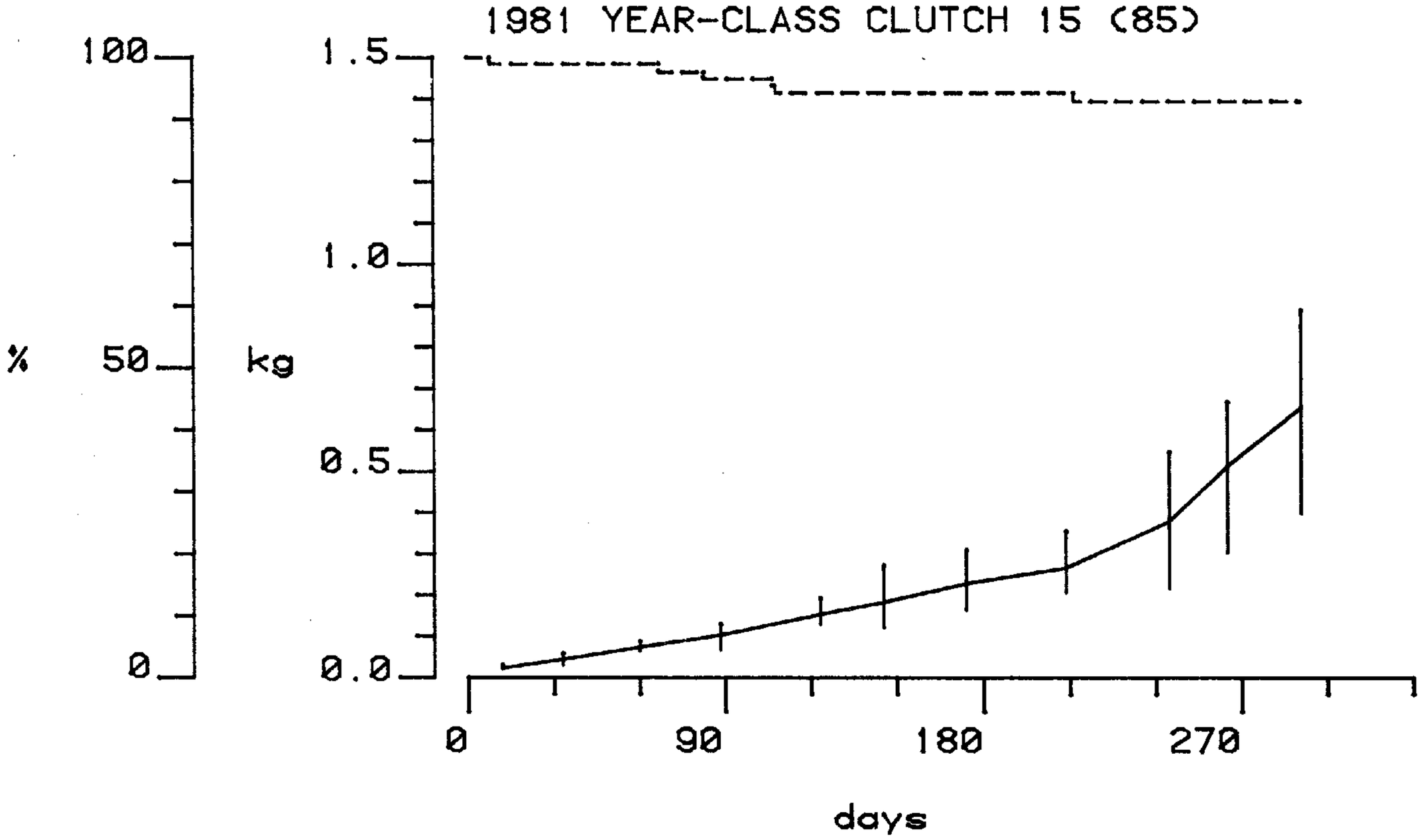
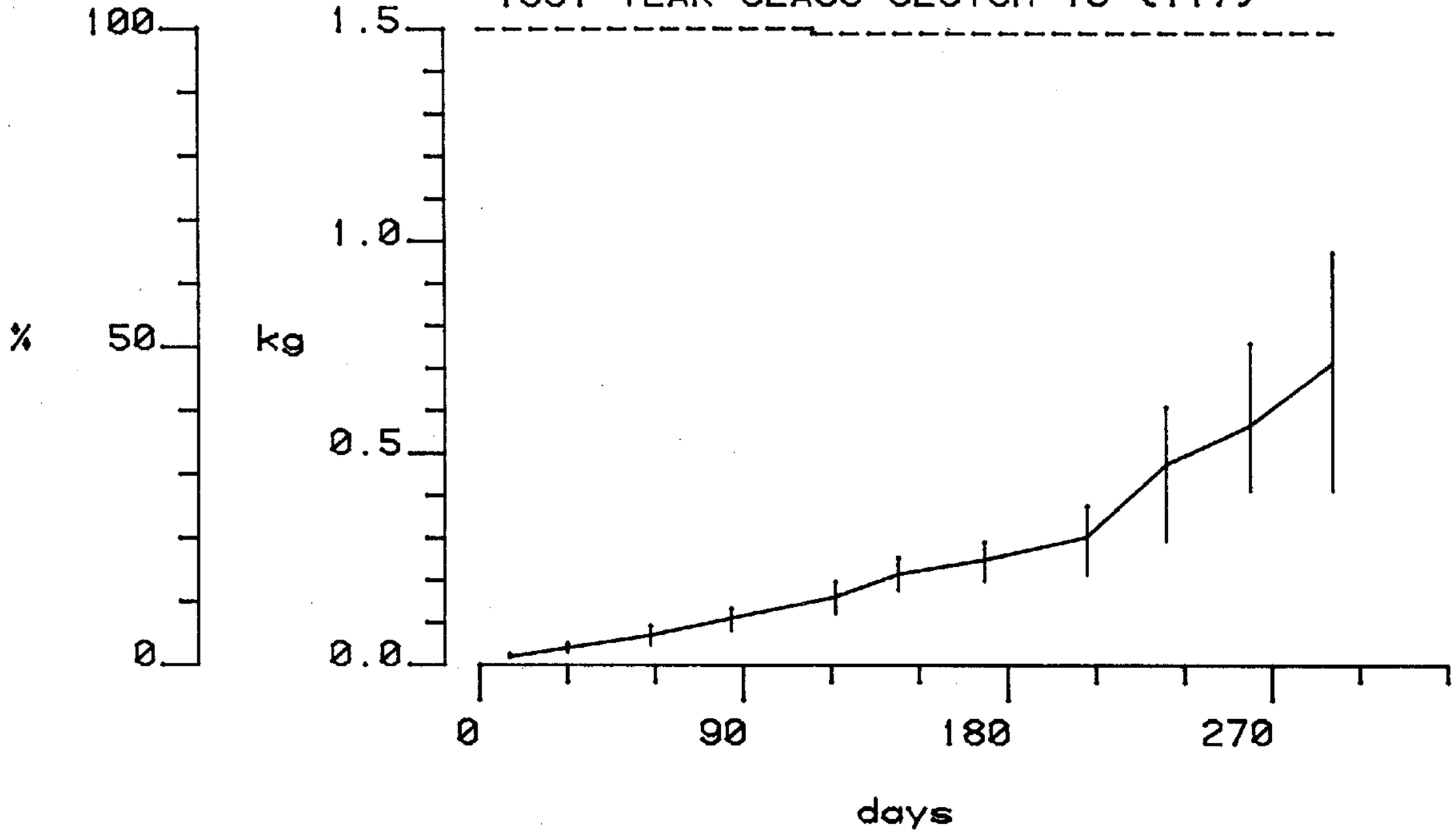
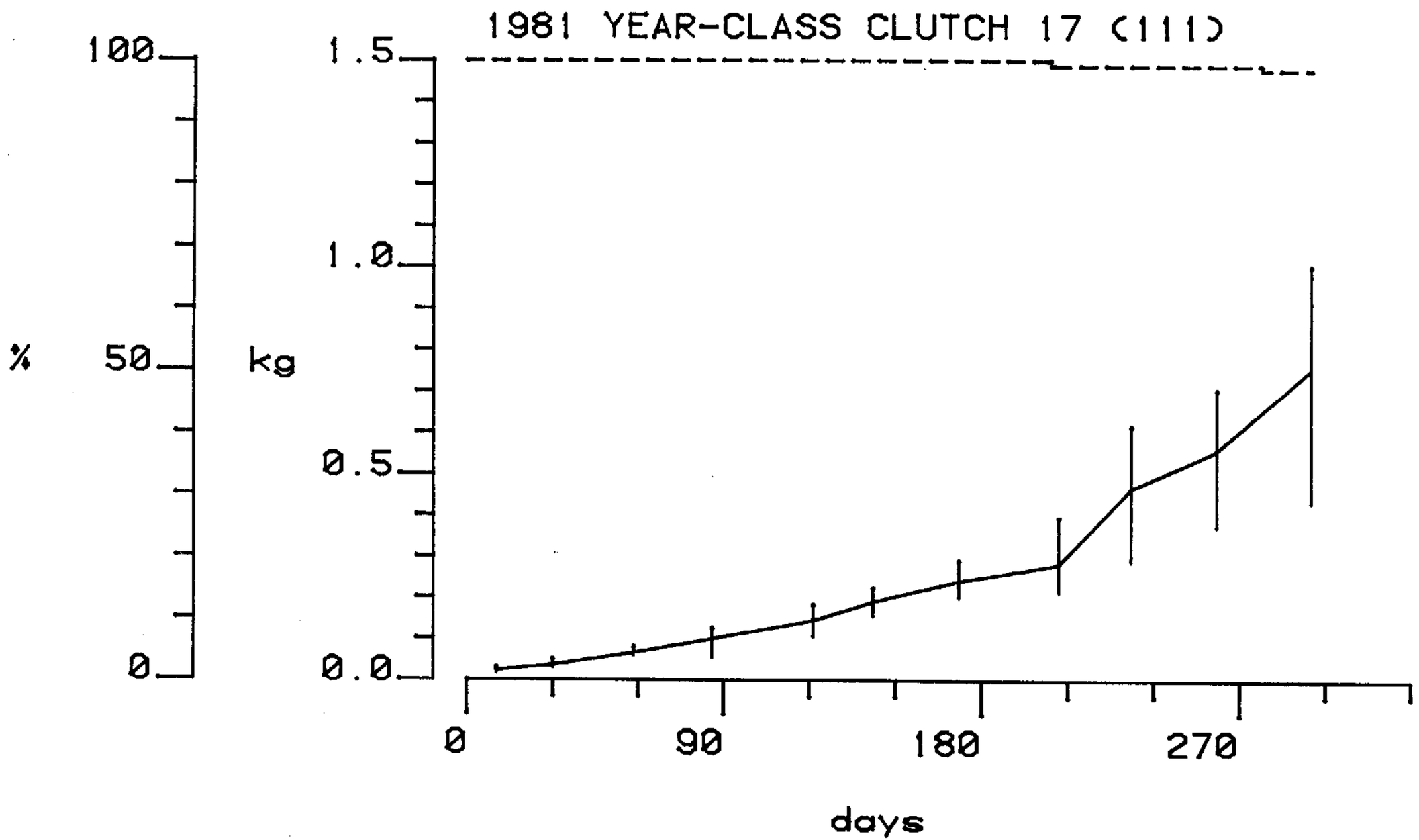
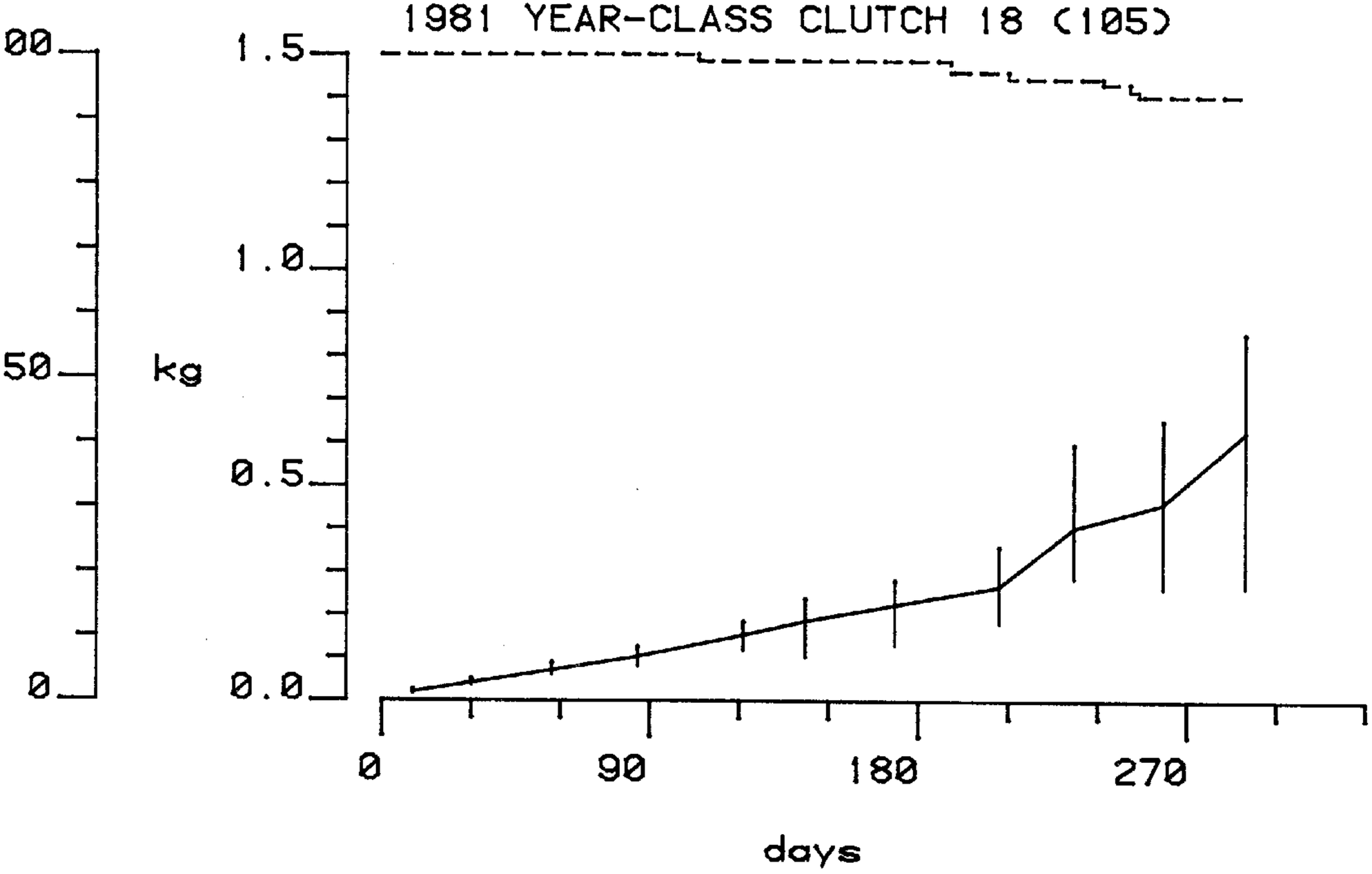
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

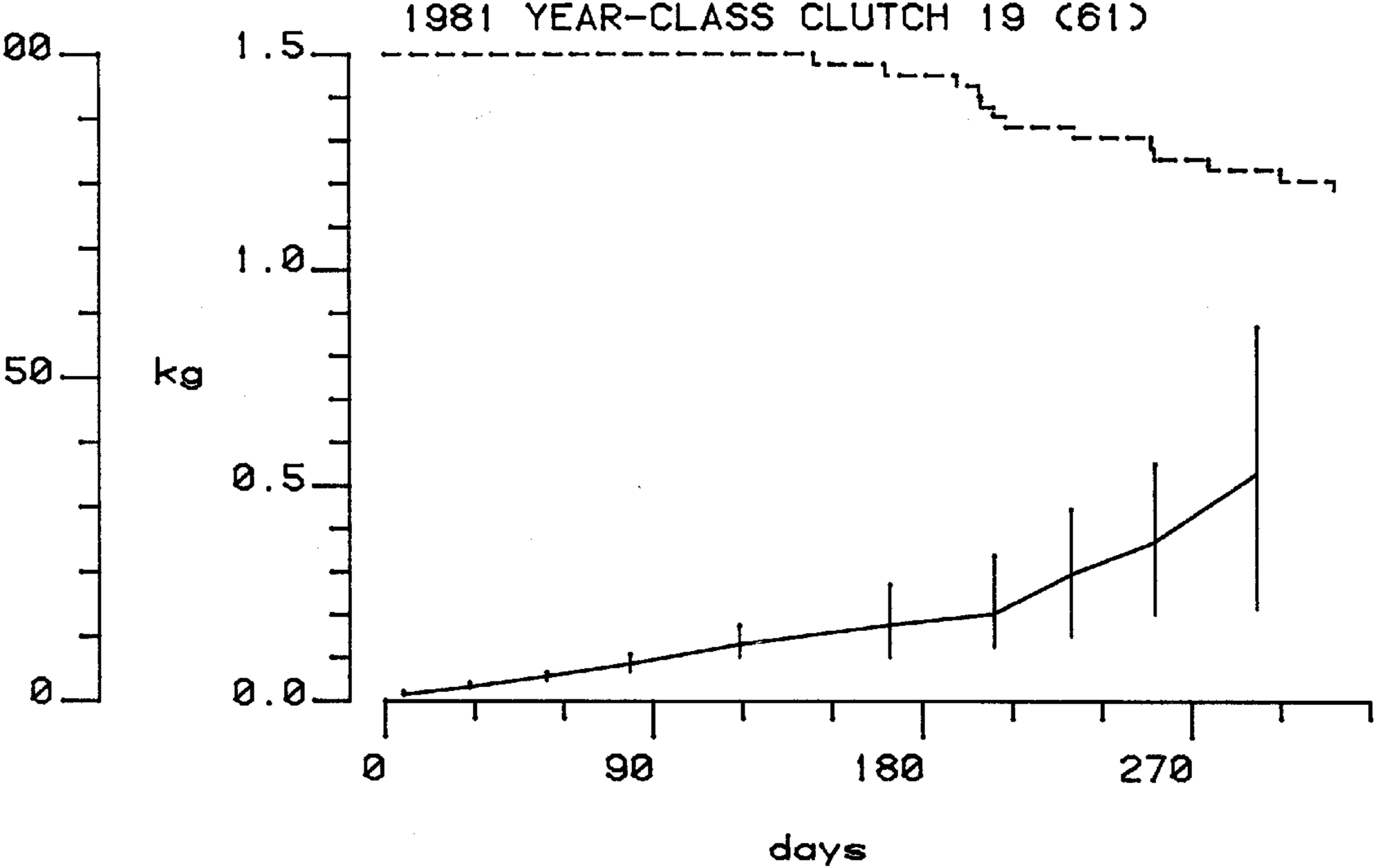

1981 YEAR-CLASS CLUTCH 14 (89)
100
%
50
0
kg
1.5
1.0
0.5
0.0
0
90
180
270
days

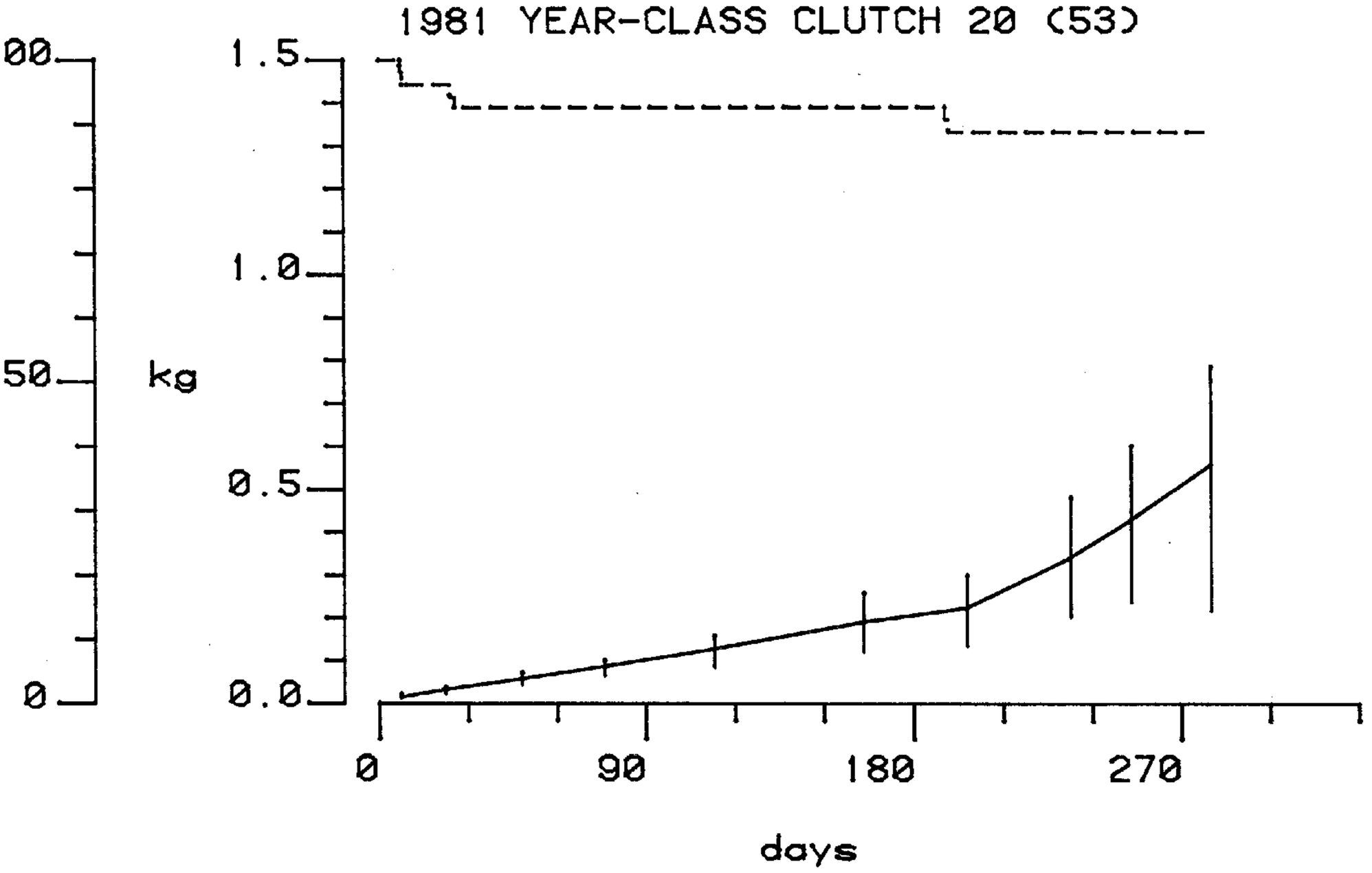

1981 YEAR-CLASS CLUTCH 15 (85)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

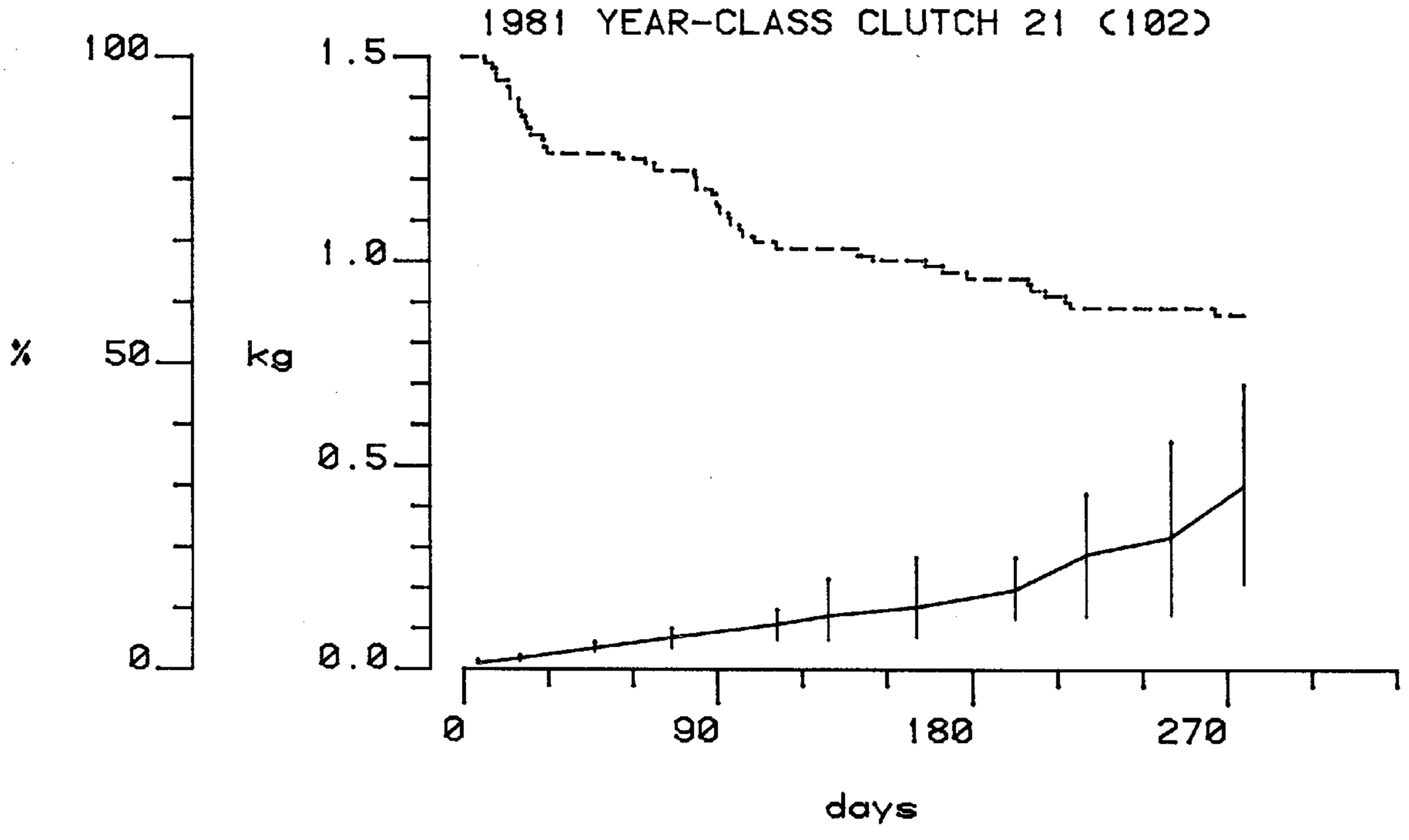

1981 YEAR-CLASS CLUTCH 16 (117)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

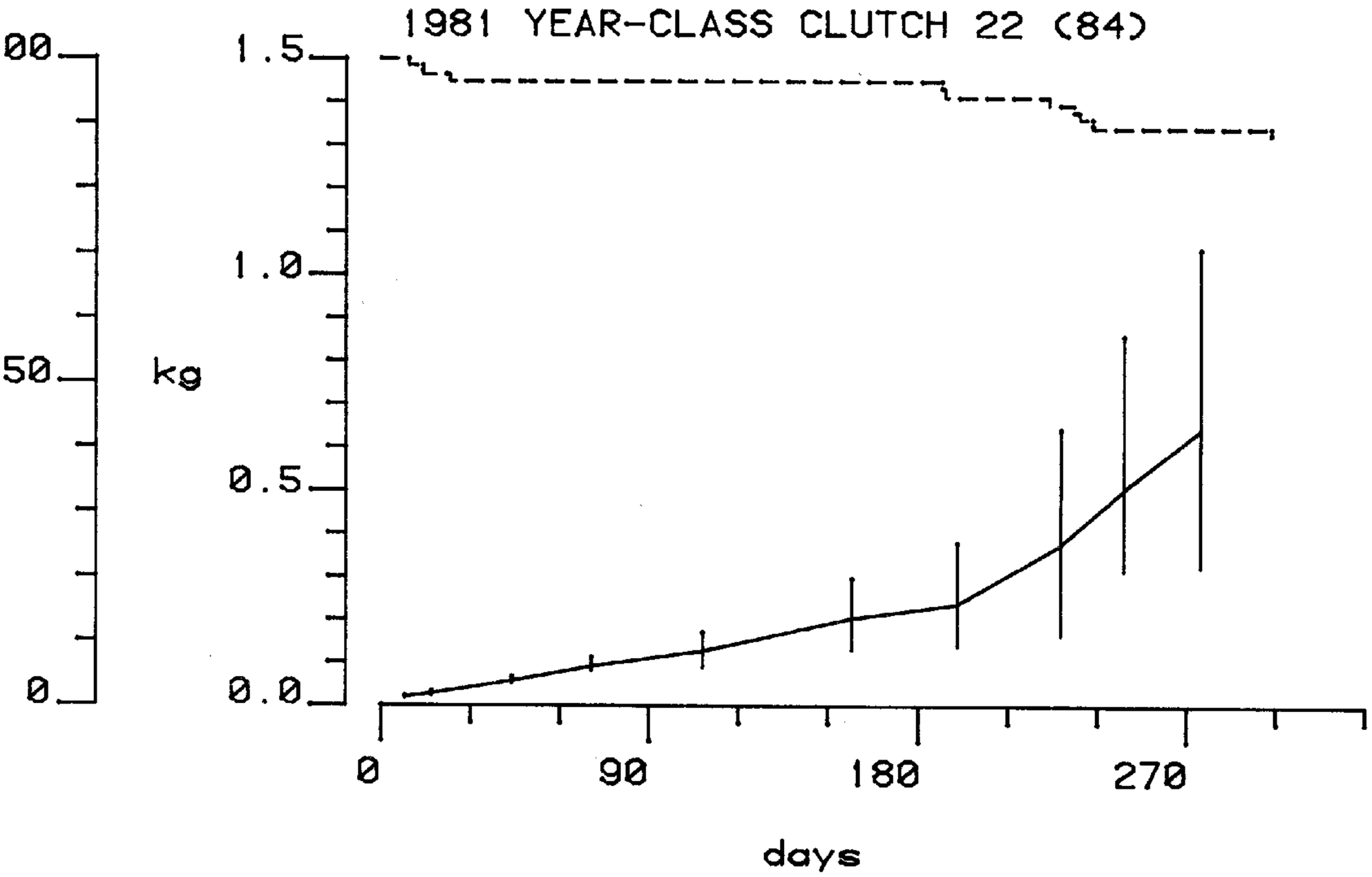

1981 YEAR-CLASS CLUTCH 17 (111)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

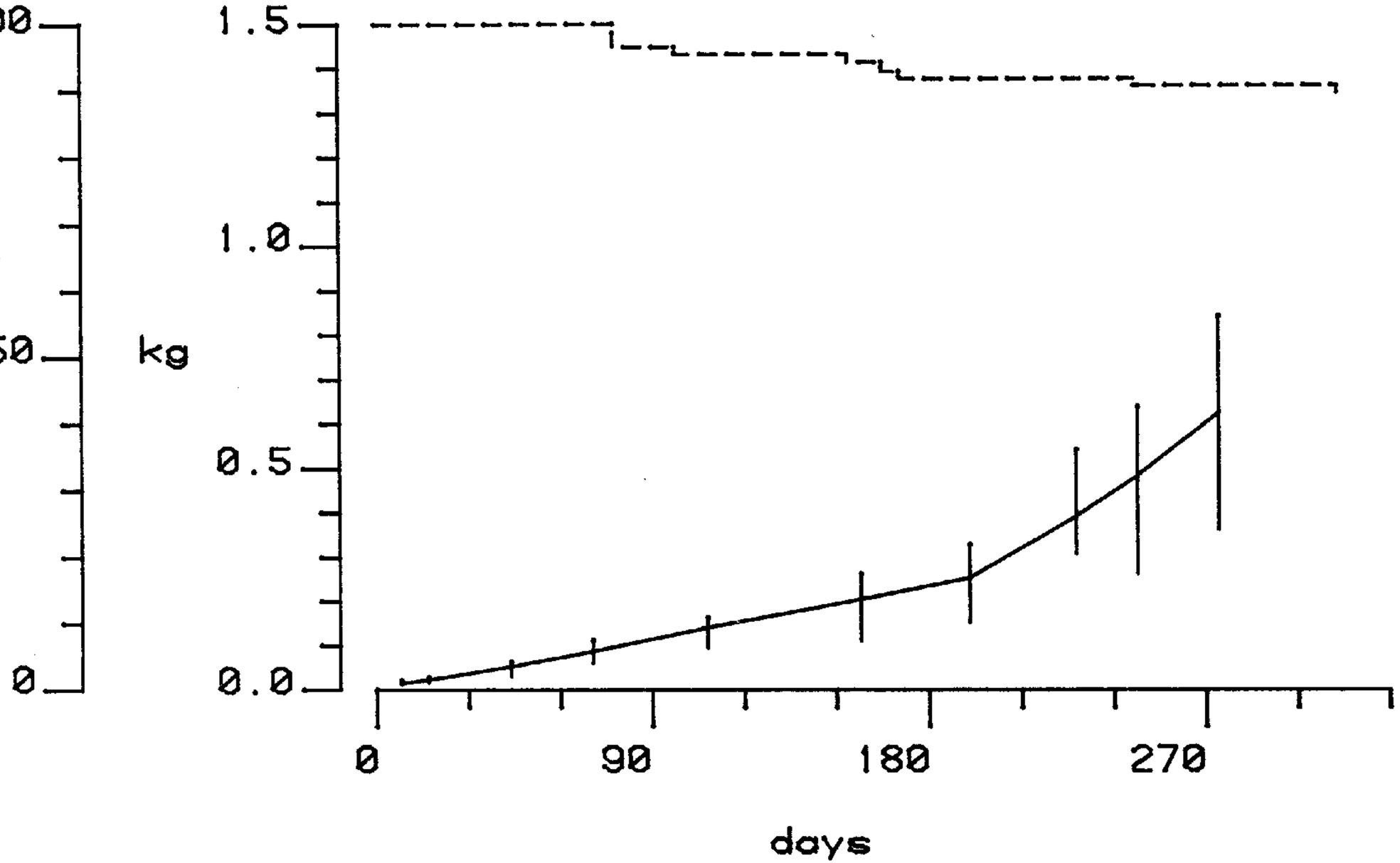

1981 YEAR-CLASS CLUTCH 18 (105)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

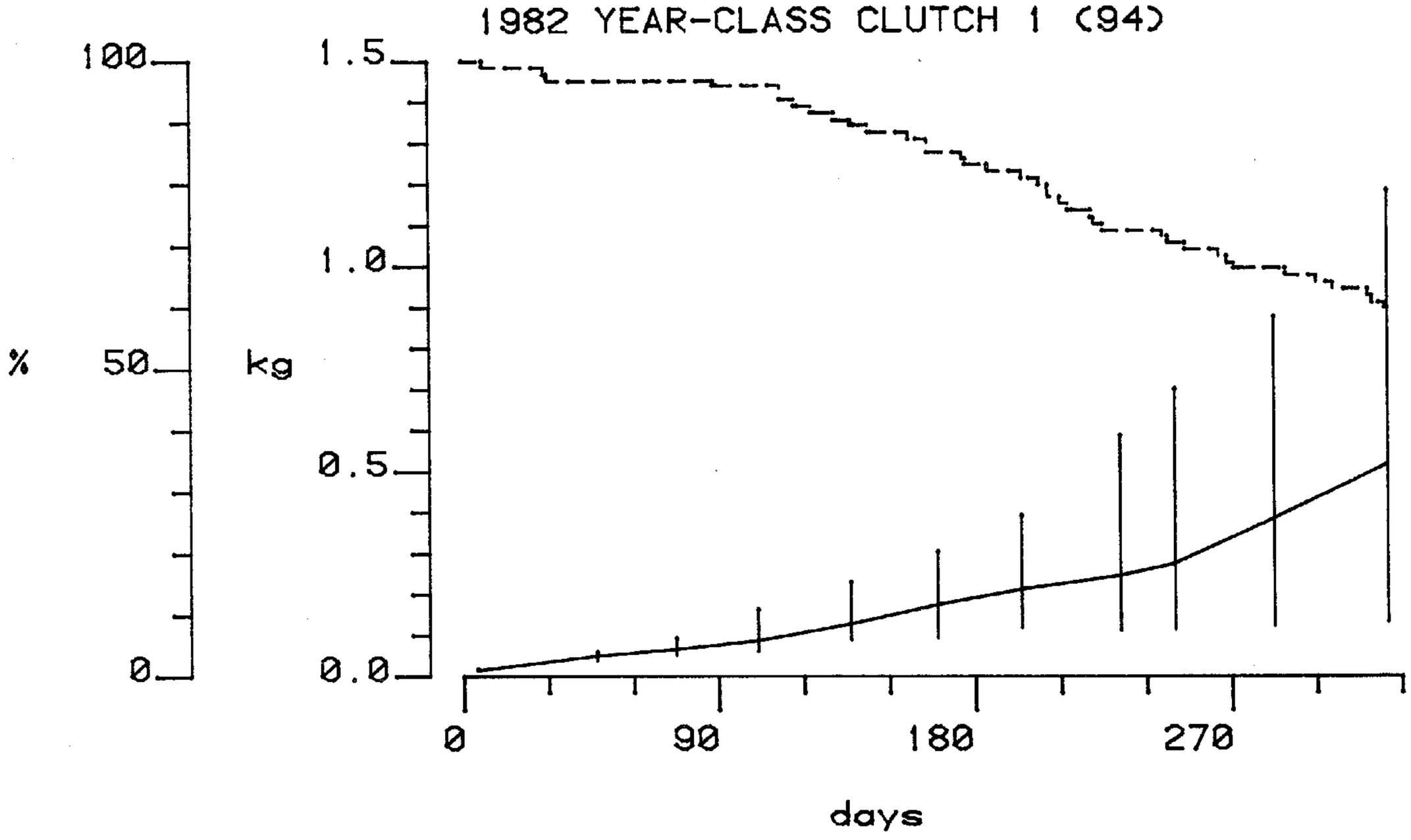

1981 YEAR-CLASS CLUTCH 19 (61)
100
%
50
0
1.5
1.0
kg
0.5
0.0
0
90
180
270
days

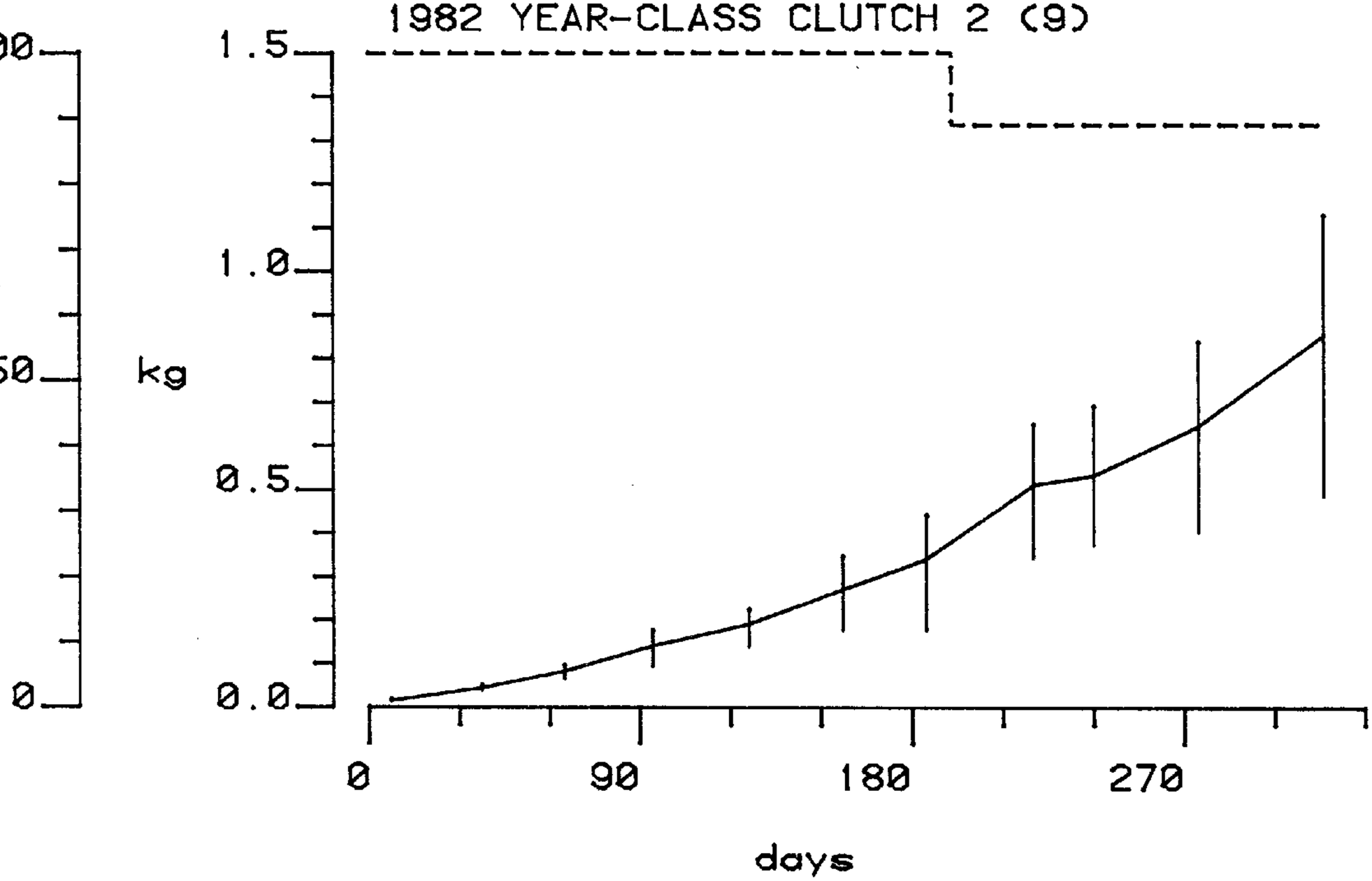

1981 YEAR-CLASS CLUTCH 20 (53)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

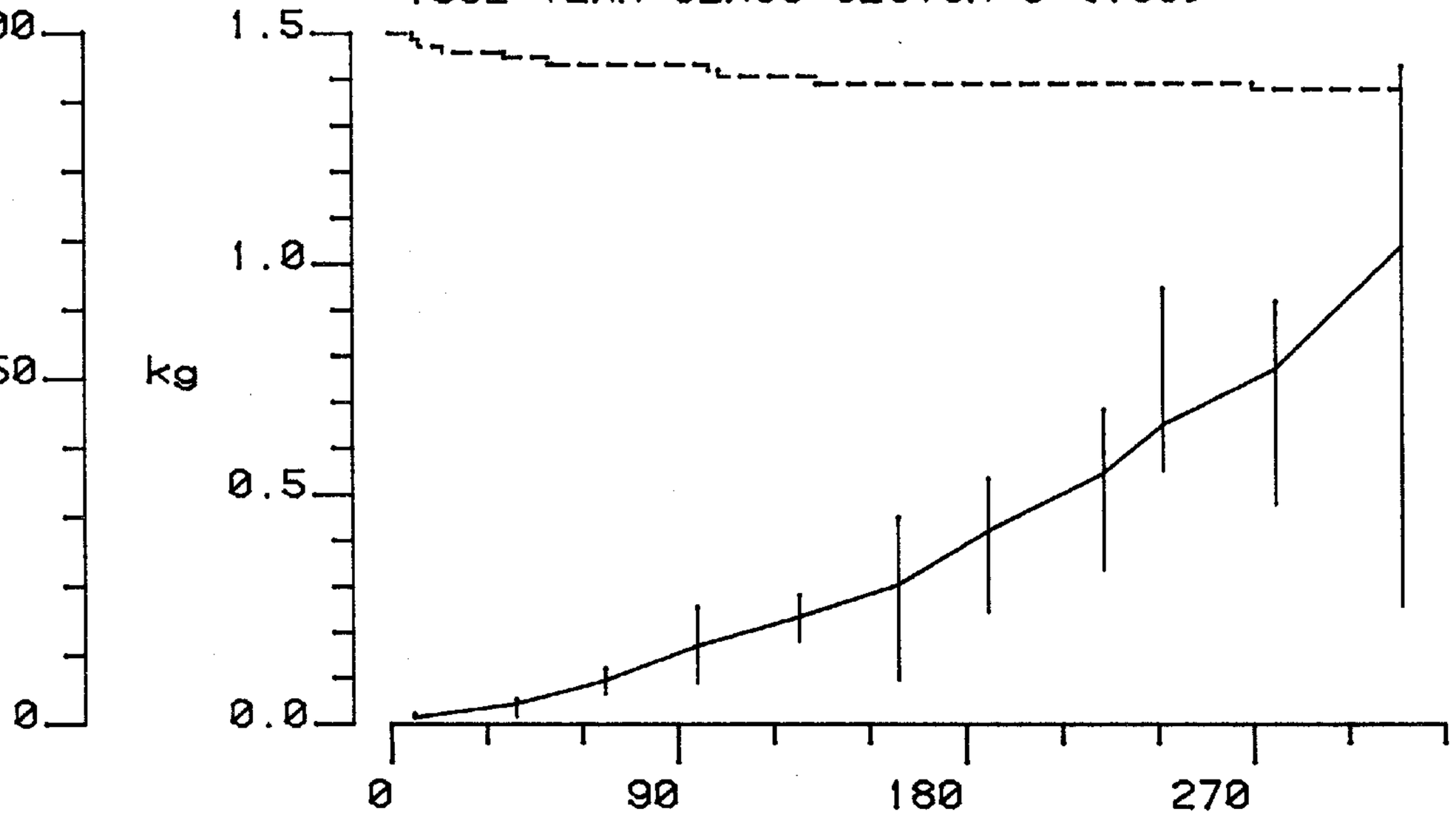

1981 YEAR-CLASS CLUTCH 21 (102)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

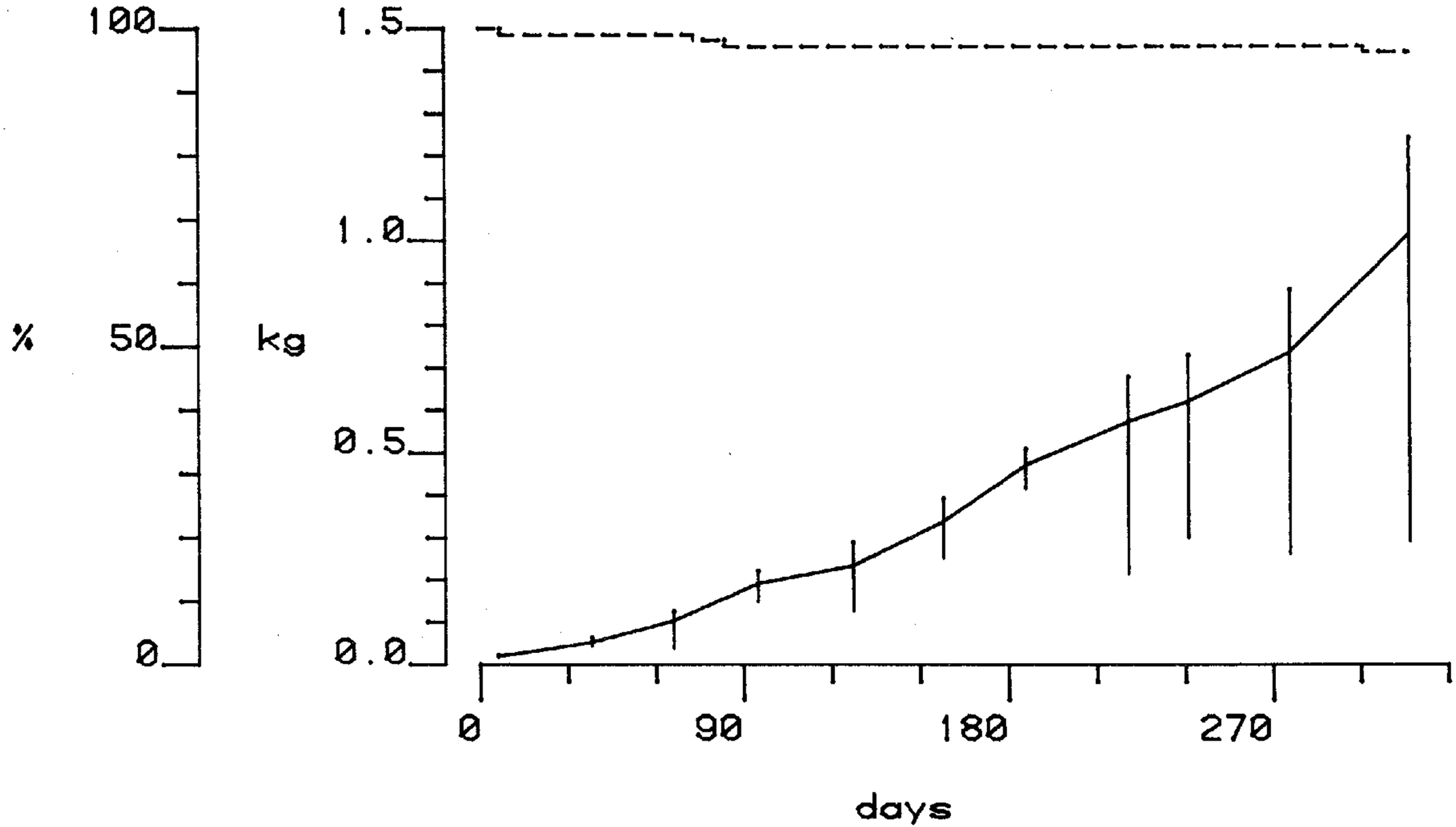

1981 YEAR-CLASS CLUTCH 22 (84)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

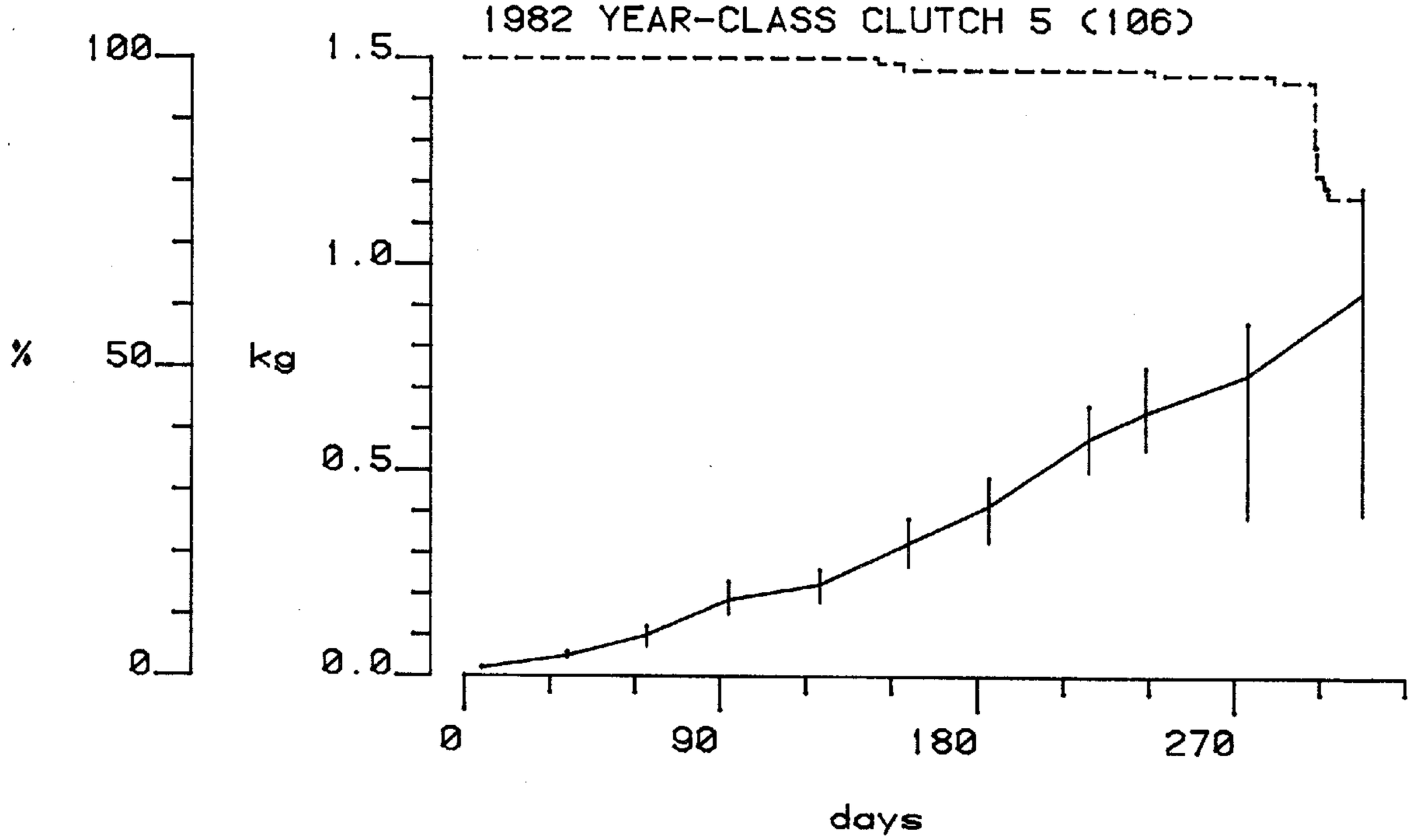

1981 YEAR-CLASS CLUTCH 23 (85)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

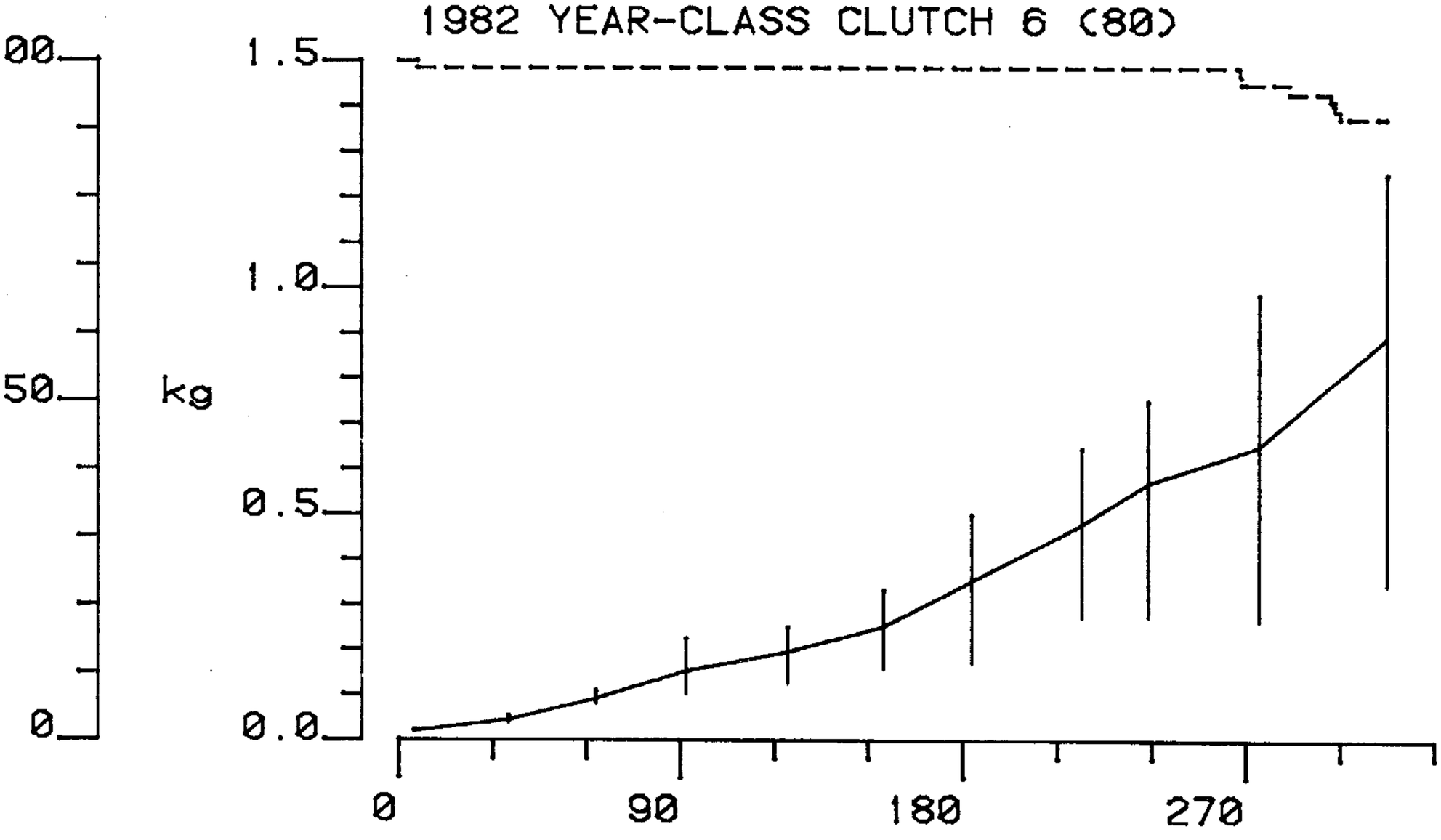

1982 YEAR-CLASS CLUTCH 1 (94)
100
%
50
0
1.5
1.0
kg
0.5
0.0
0
90
180
270
days

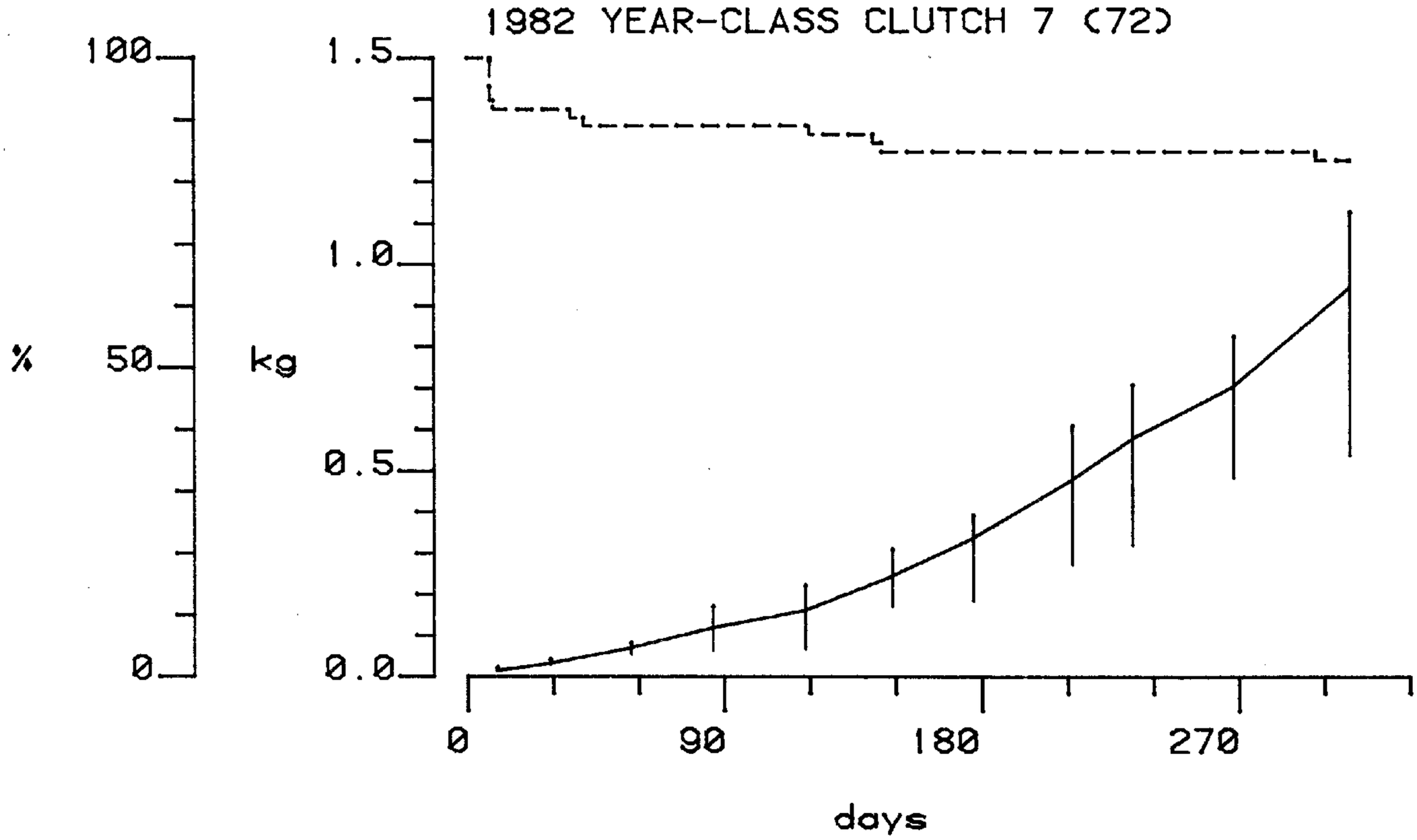

1982 YEAR-CLASS CLUTCH 2 (9)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

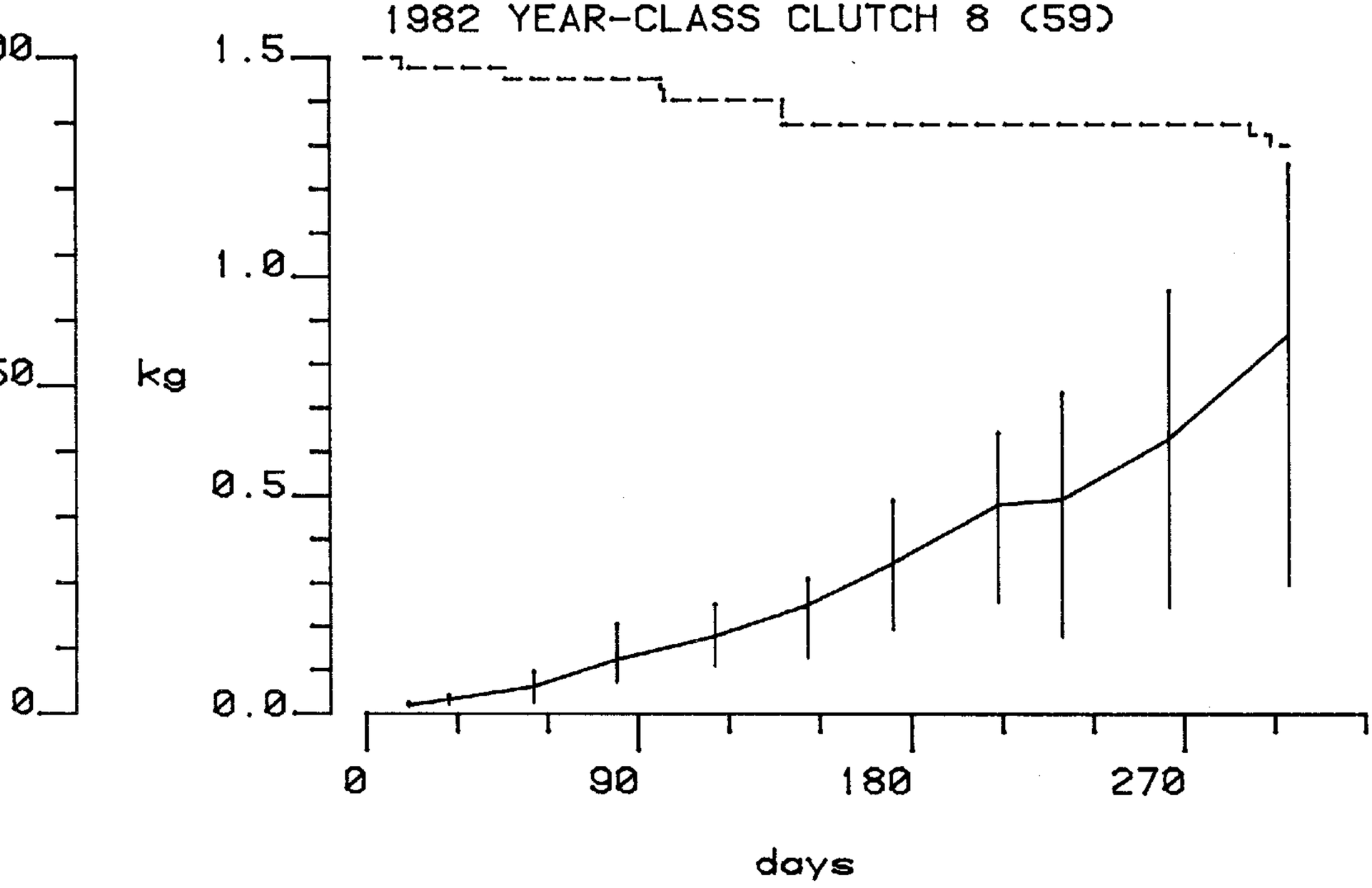

1982 YEAR-CLASS CLUTCH 3 (108)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

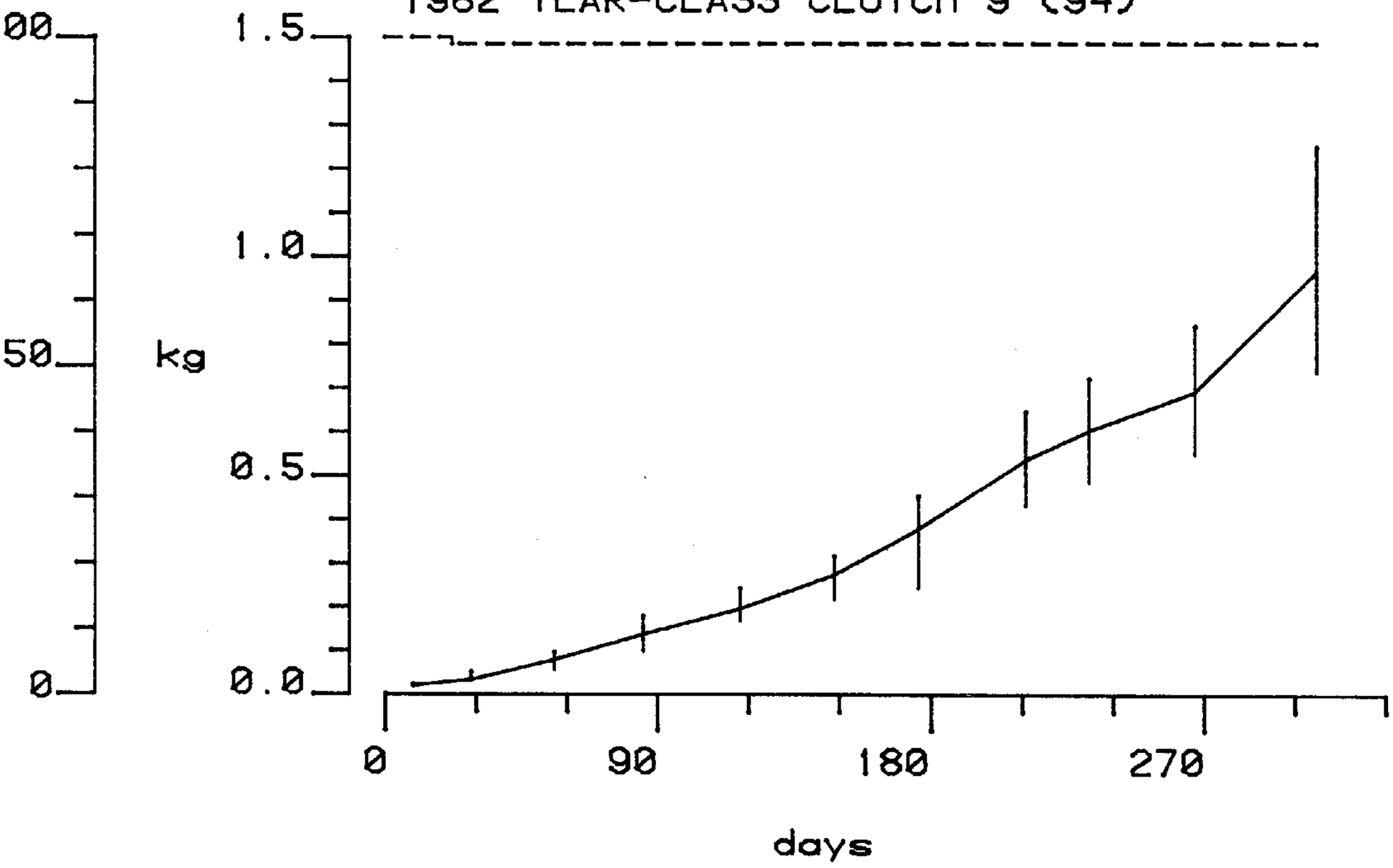

1982 YEAR-CLASS CLUTCH 4 (101)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

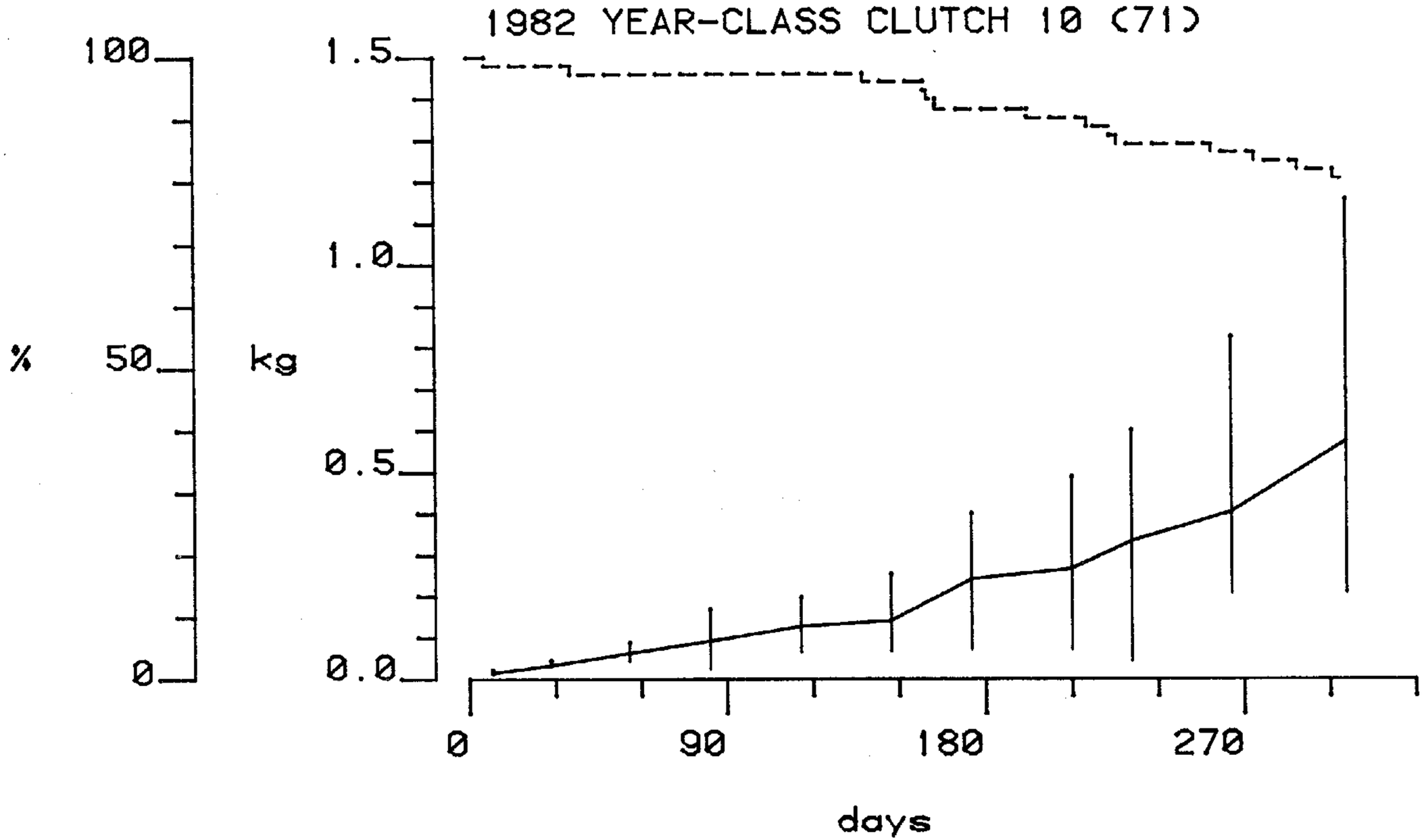

1982 YEAR-CLASS CLUTCH 5 (106)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

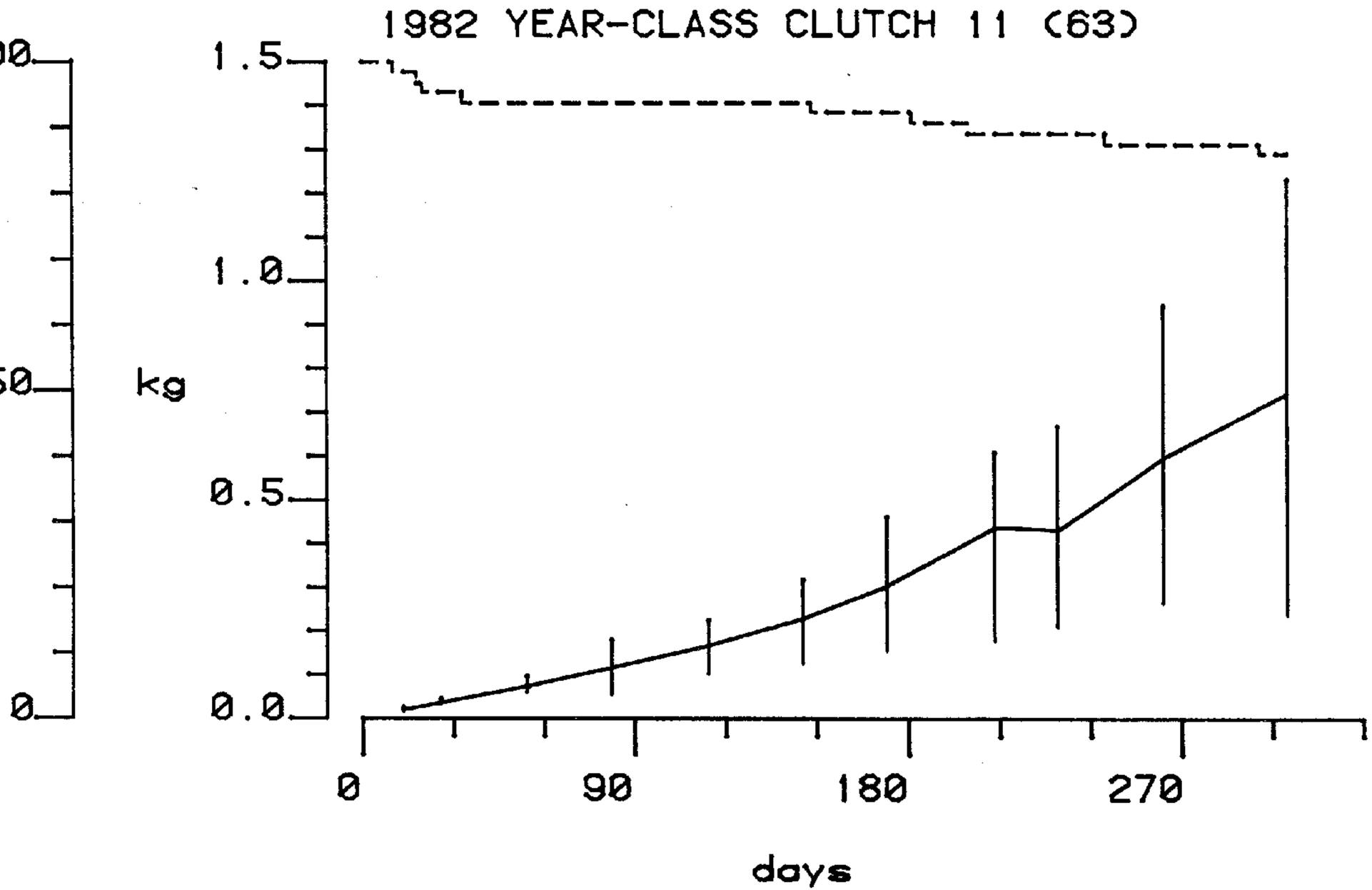

1982 YEAR-CLASS CLUTCH 6 (80)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

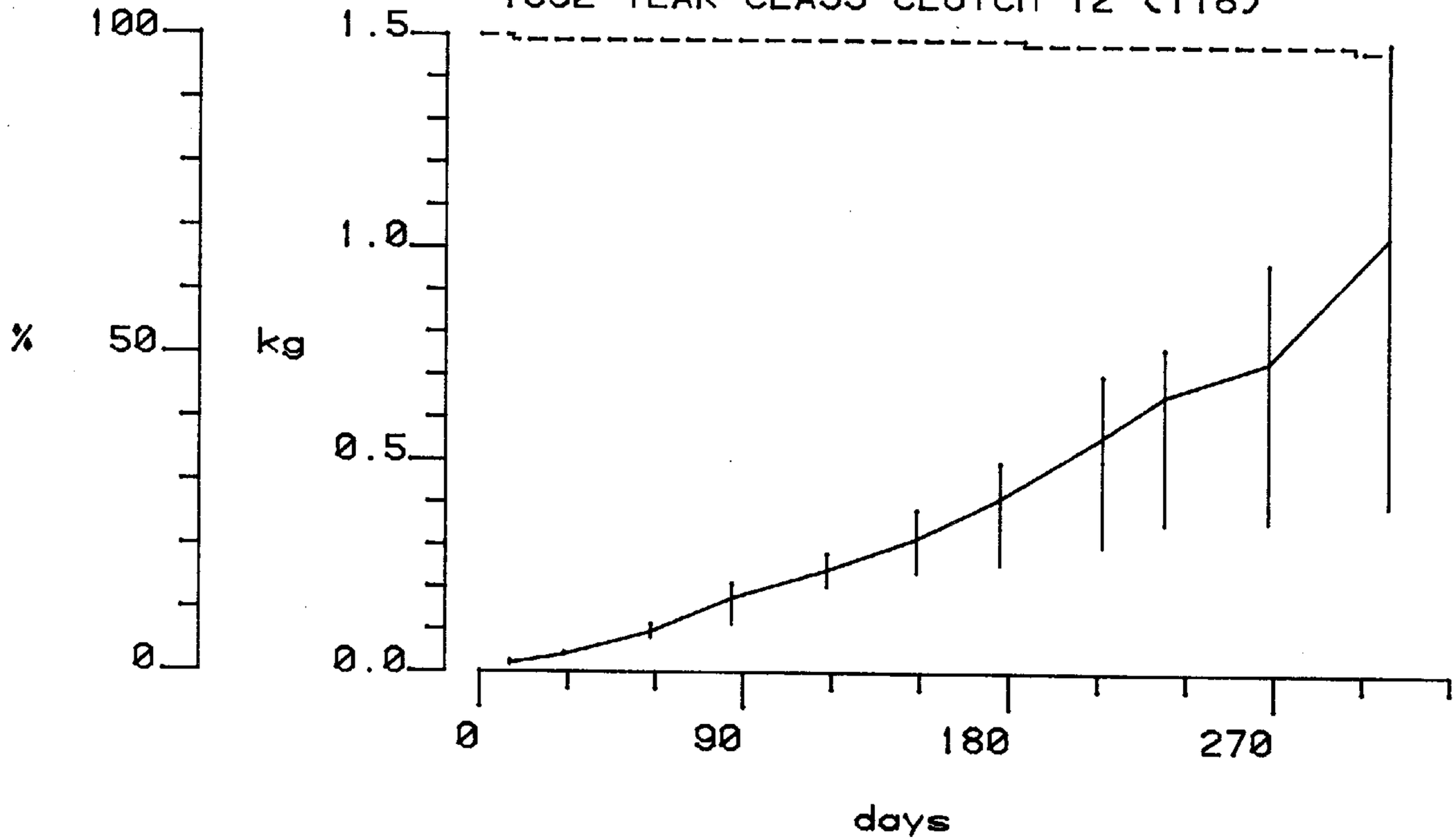

1982 YEAR-CLASS CLUTCH 7 (72)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

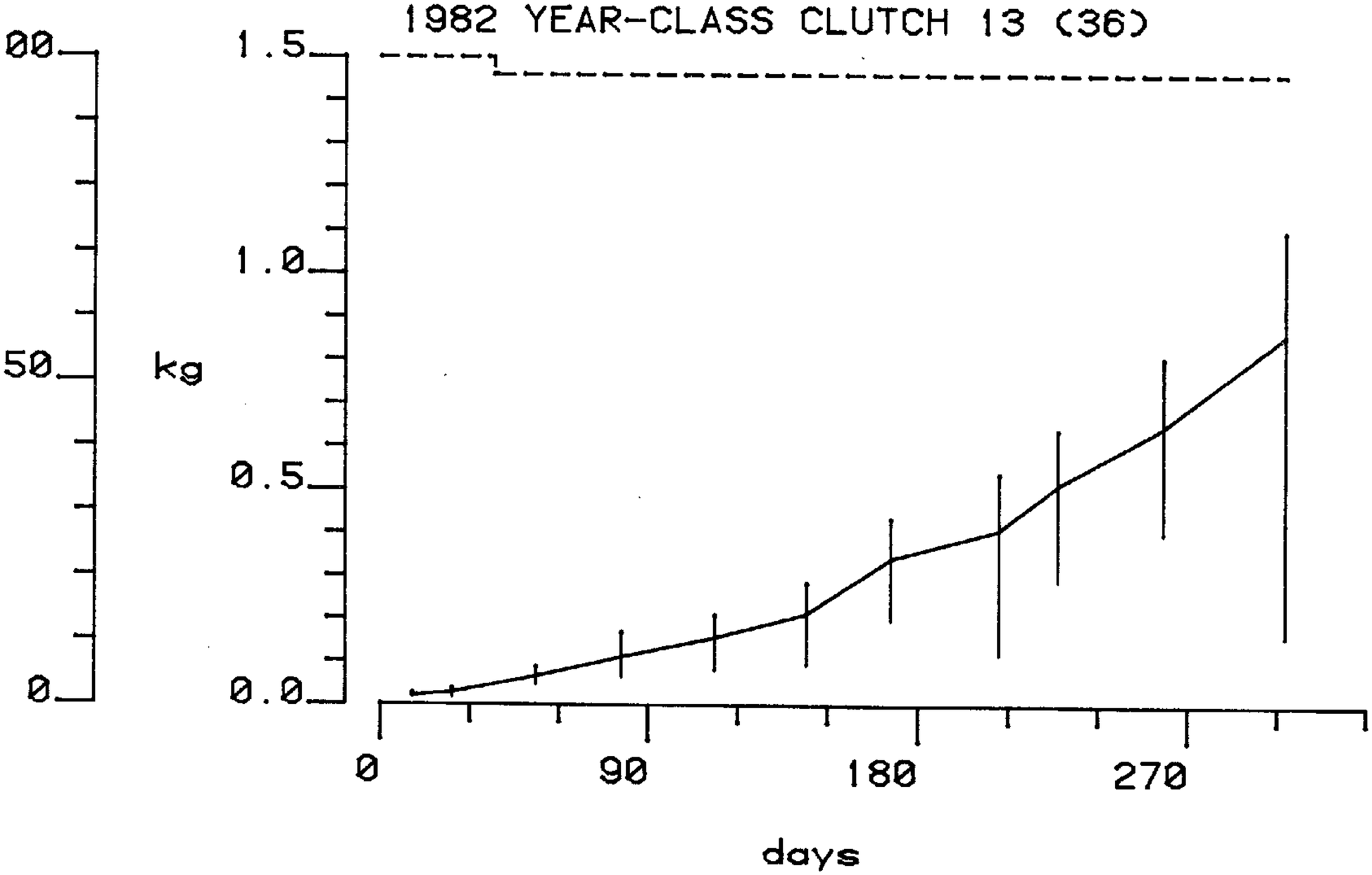

1982 YEAR-CLASS CLUTCH 8 (59)
100
%
50
0
1.5
1.0
kg
0.5
0.0
0
90
180
270
days

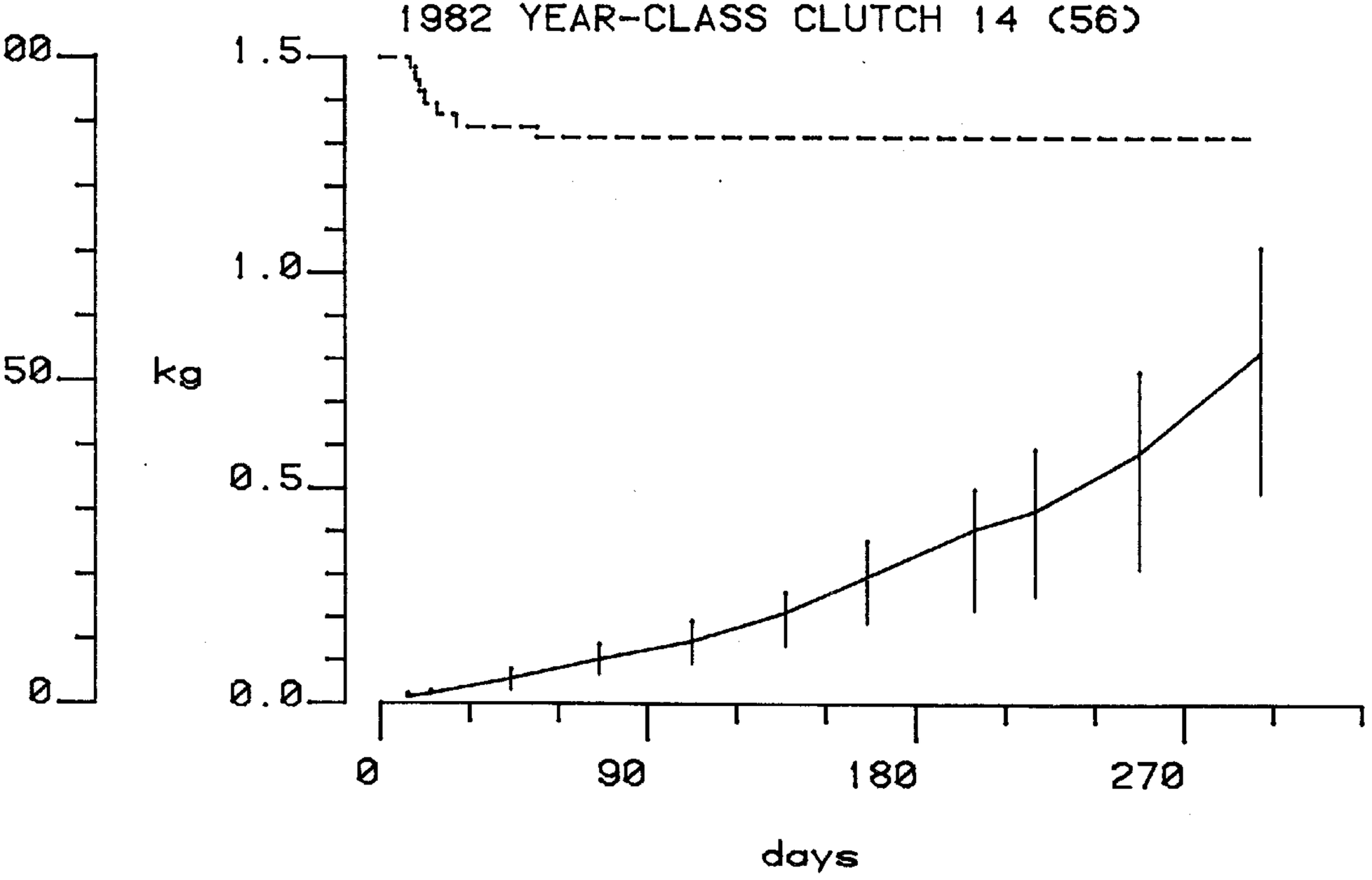

1982 YEAR-CLASS CLUTCH 9 (94)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

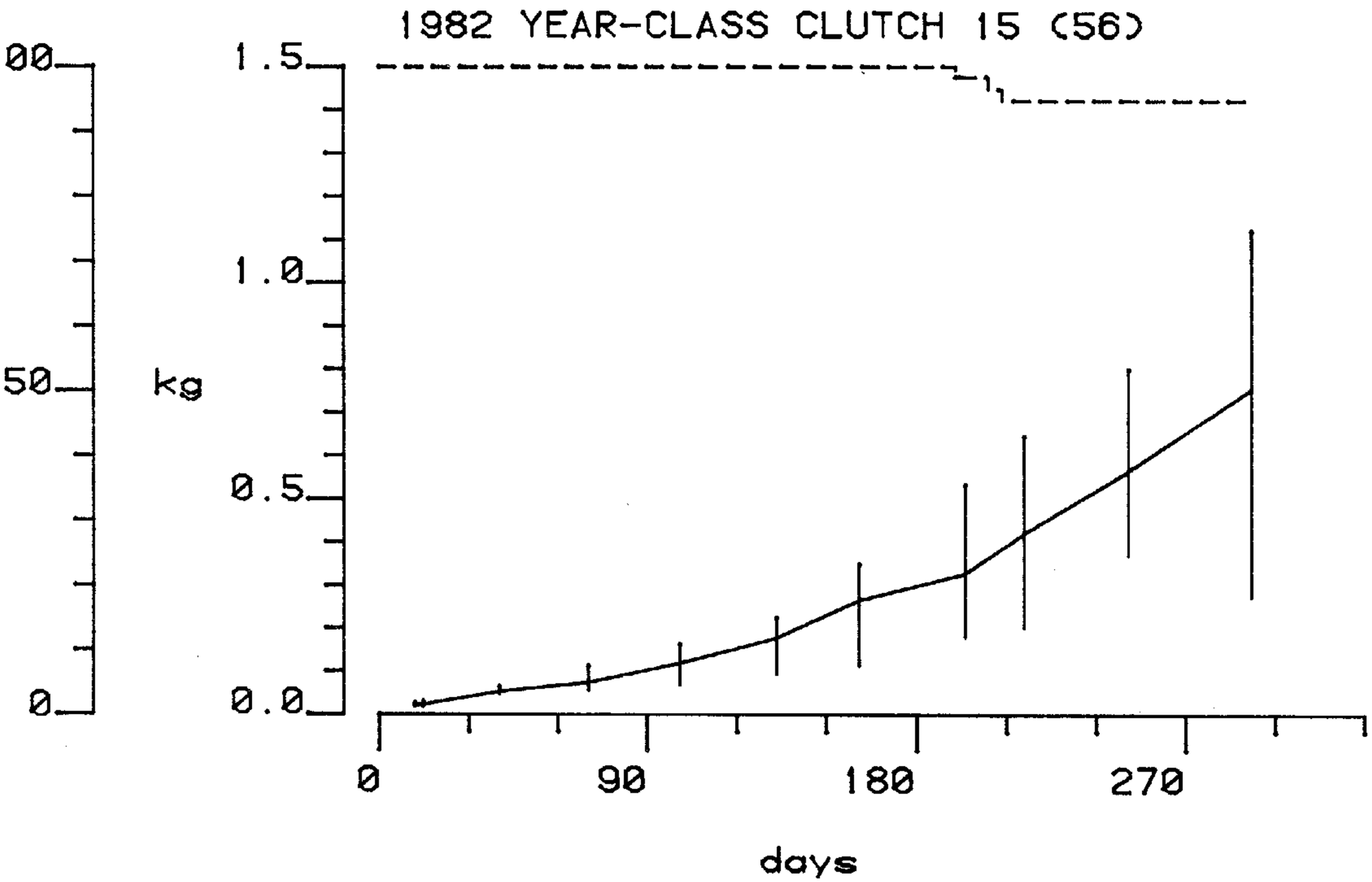

1982 YEAR-CLASS CLUTCH 10 (71)
100
%
50
0
kg
1.5
1.0
0.5
0.0
0
90
180
270
days

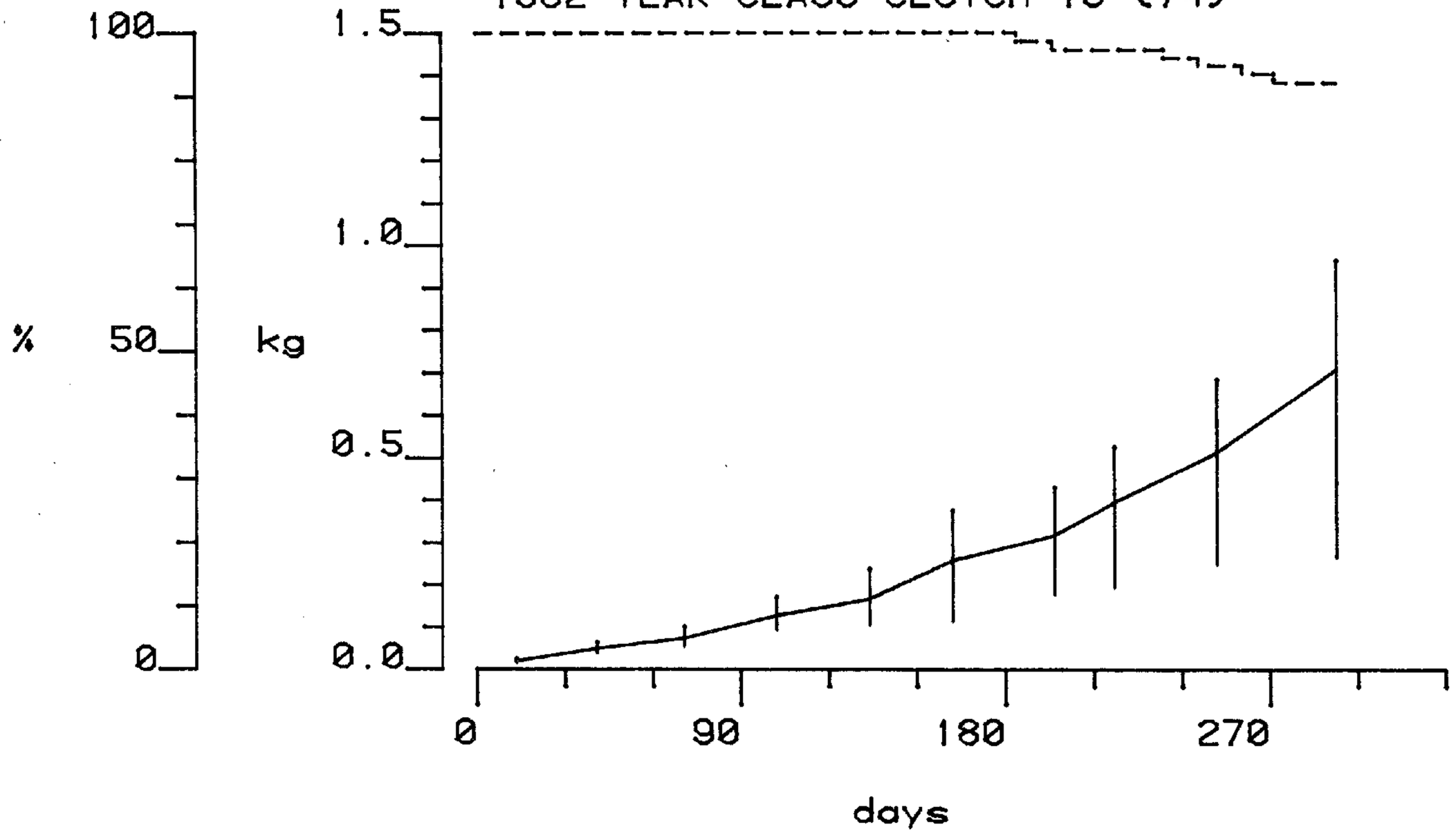

1982 YEAR-CLASS CLUTCH 11 (63)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

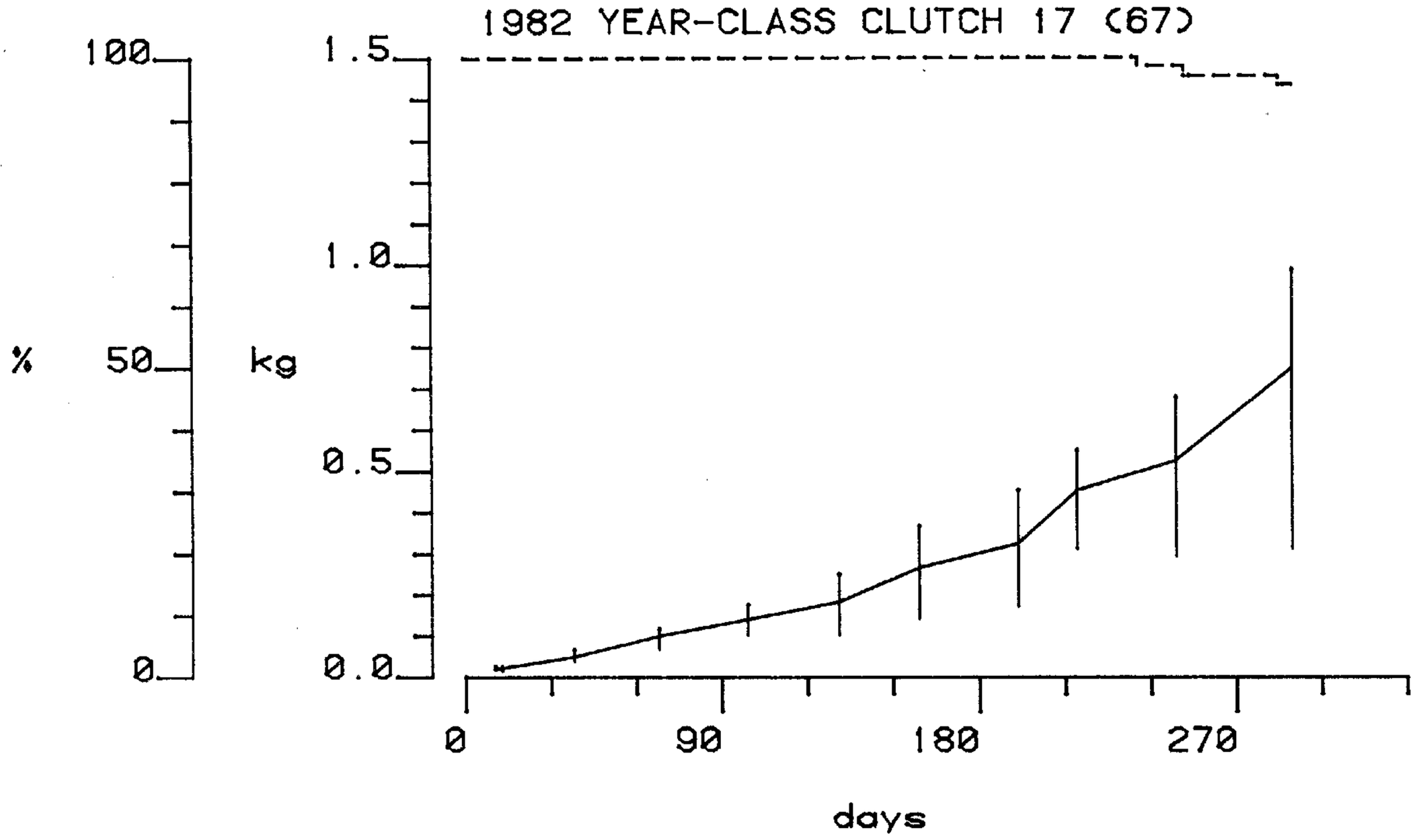

1982 YEAR-CLASS CLUTCH 12 (118)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

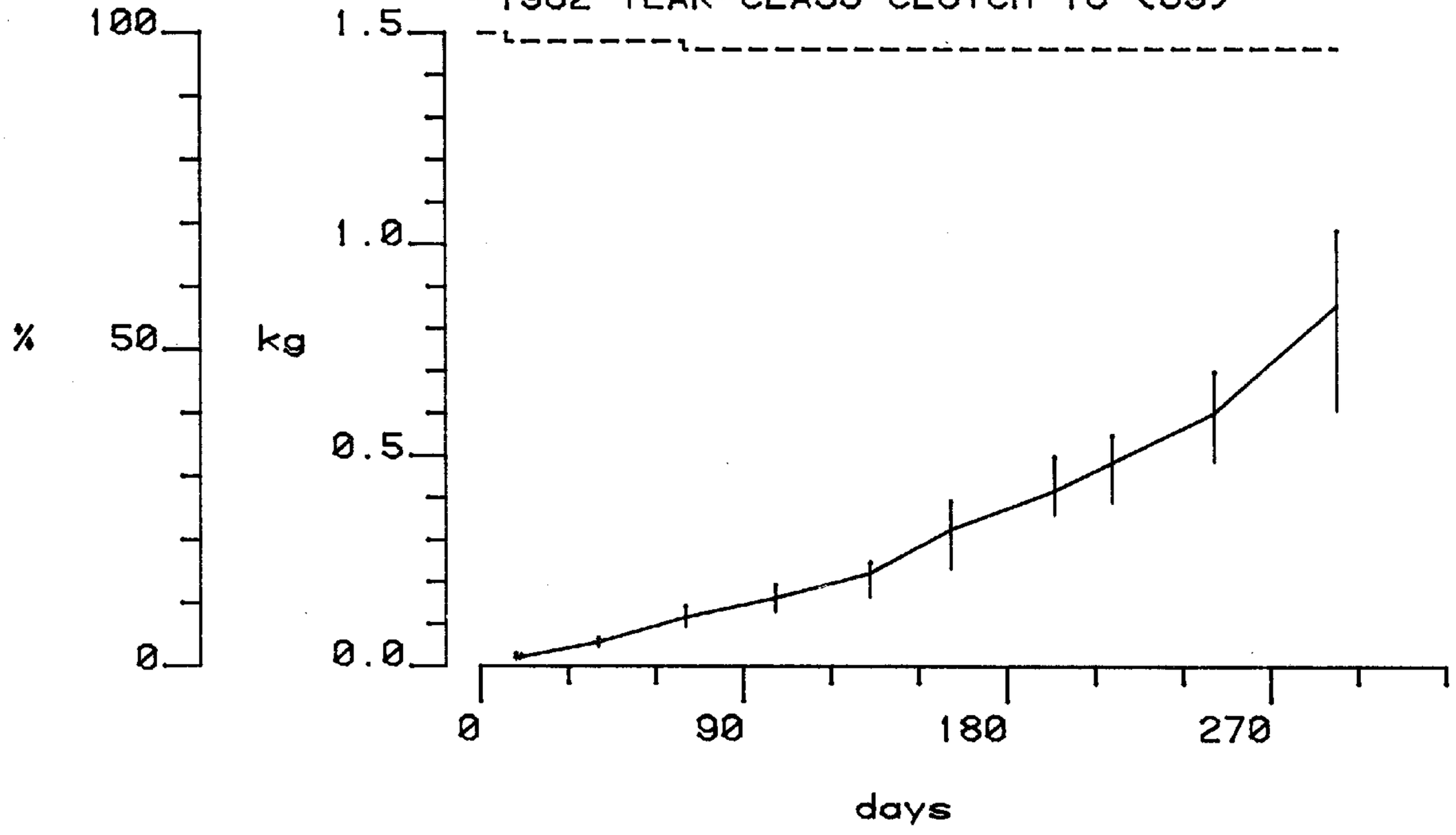

1982 YEAR-CLASS CLUTCH 13 (36)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

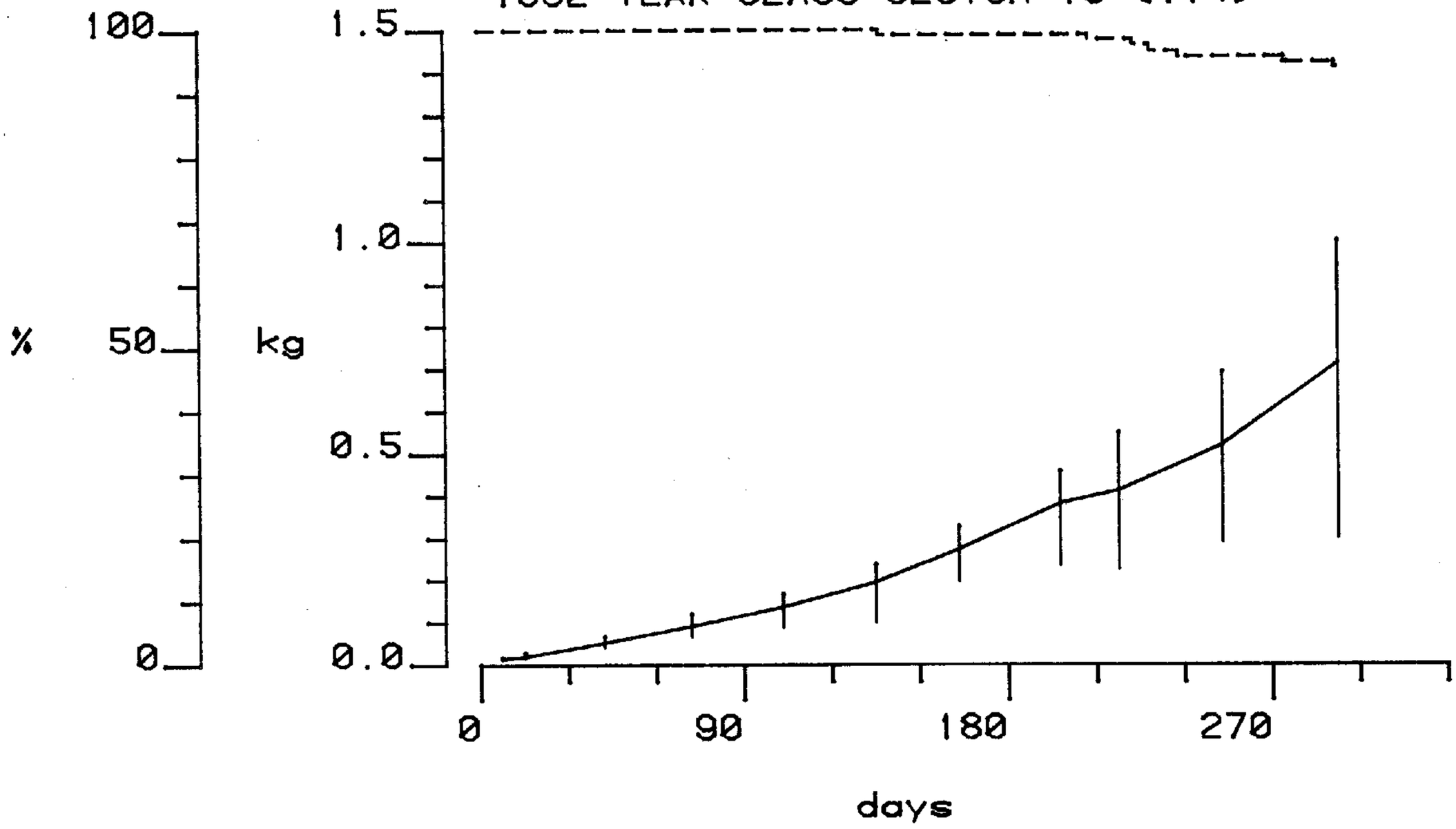

1982 YEAR-CLASS CLUTCH 14 (56)
100
%
50
0
1.5
1.0
kg
0.5
0.0
0
90
180
270
days

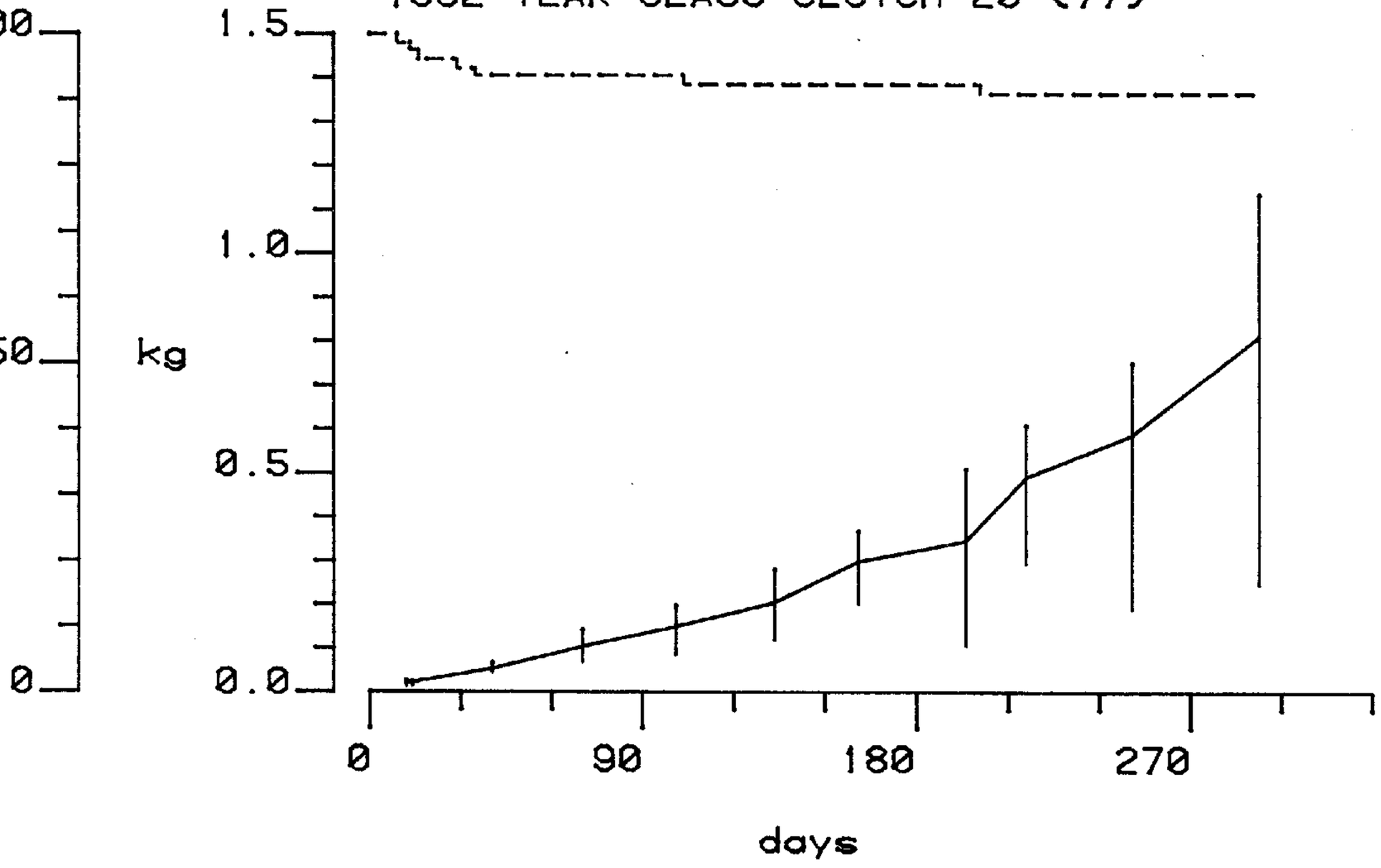

1982 YEAR-CLASS CLUTCH 15 (56)
100
%
50
0
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

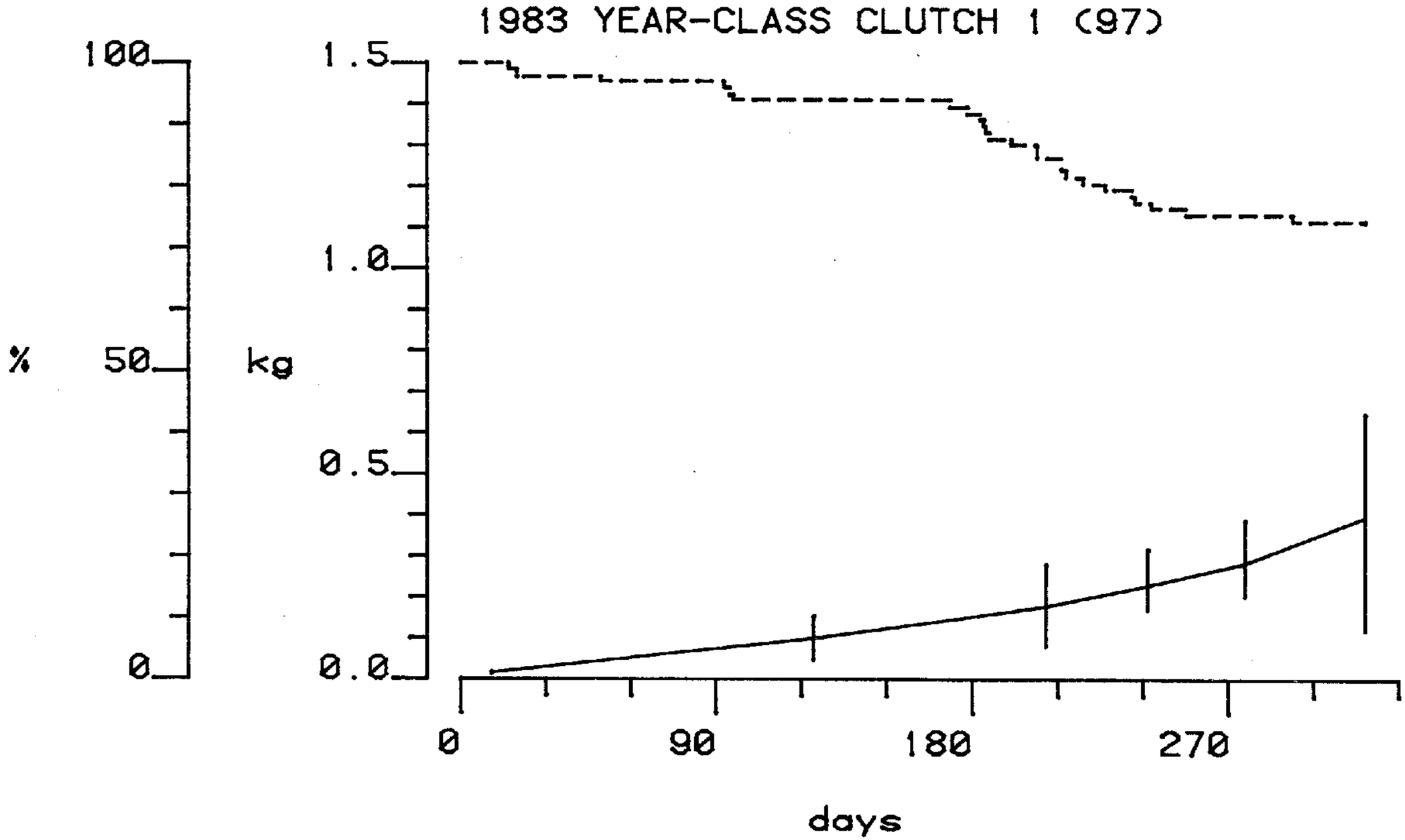

1982 YEAR-CLASS CLUTCH 16 (74)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

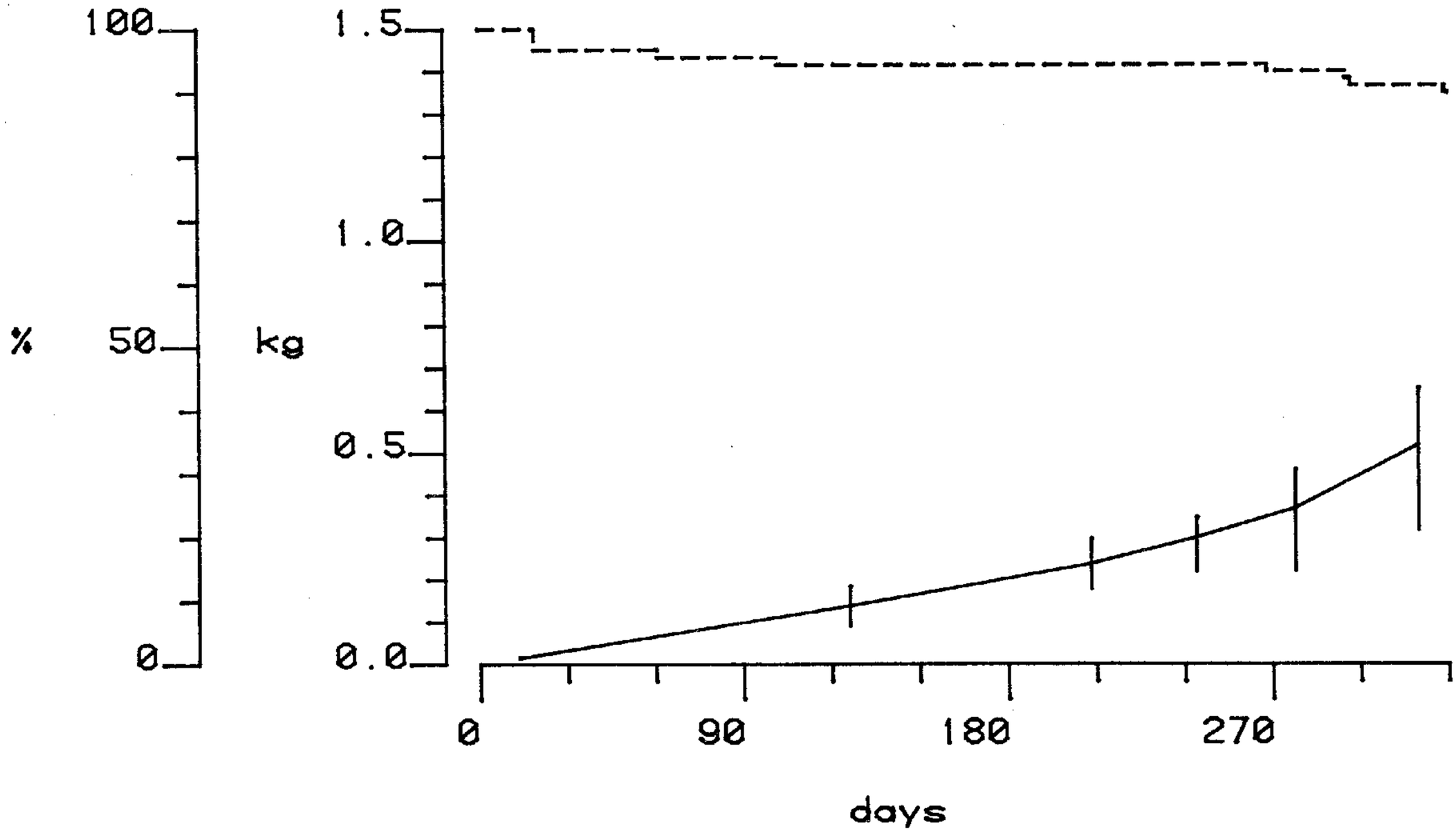

1982 YEAR-CLASS CLUTCH 17 (67)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days

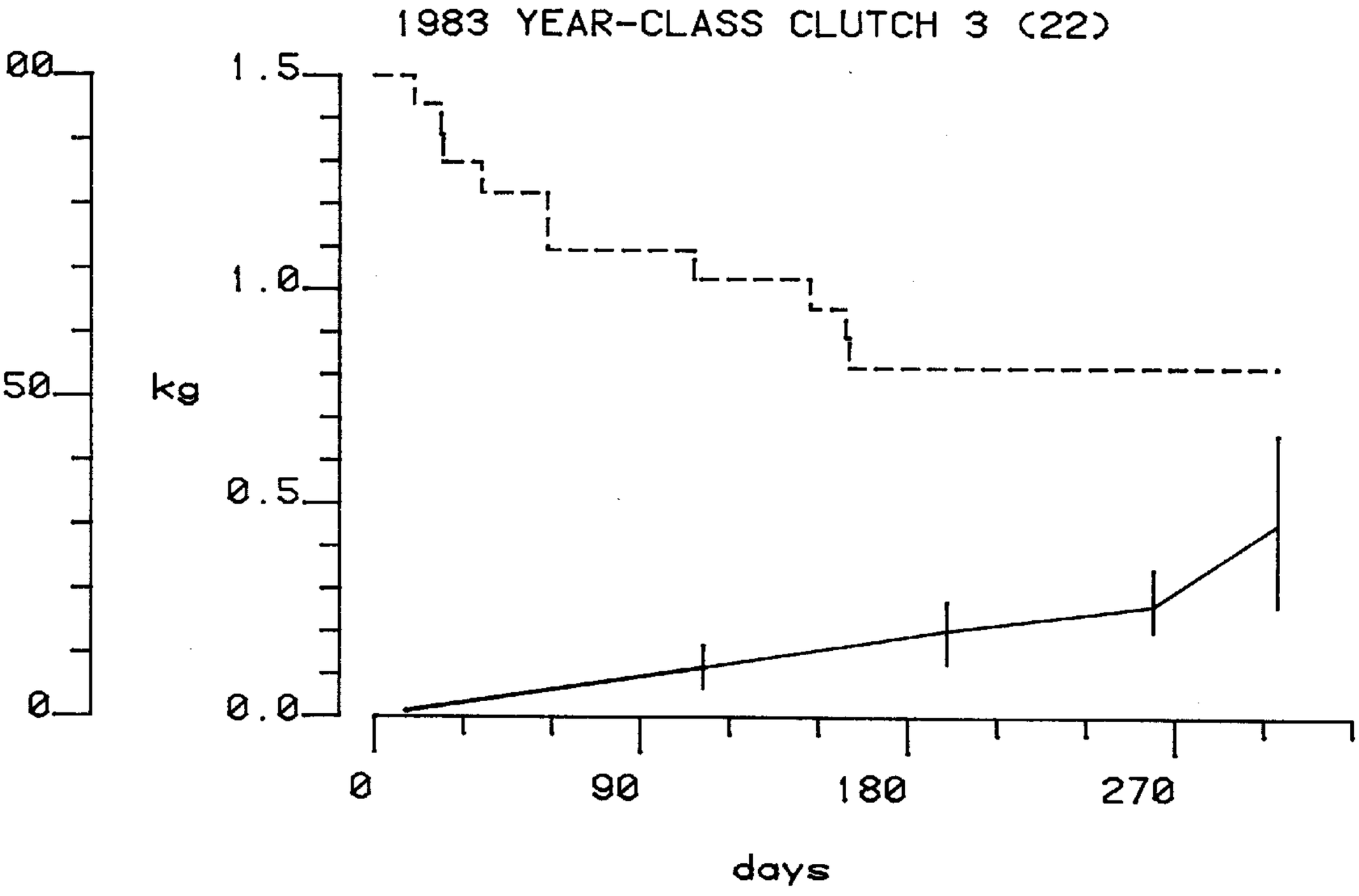

1982 YEAR-CLASS CLUTCH 18 (69)
100
%
50
0
1.5
1.0
kg
0.5
0.0
0
90
180
270
days


1982 YEAR-CLASS CLUTCH 19 (114)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days


1982 YEAR-CLASS CLUTCH 20 (77)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days


1983 YEAR-CLASS CLUTCH 1 (97)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days


1983 YEAR-CLASS CLUTCH 2 (87)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days


1983 YEAR-CLASS CLUTCH 3 (22)
100
50
0
%
1.5
1.0
0.5
0.0
kg
0
90
180
270
days