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CONTROLLED REARING OF DUNGENESS CRAB LARVAE AND THE INFLUENCE OF ENVIRONMENTAL CONDITIONS ON THEIR SURVIVAL

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INTRODUCTION

During the first year of the program successful culture methods were developed for rearing Dungeness crab larvae (Reed, 1966). The purpose of the second year's work was to define the effects of wide ranges of temperature and salinity on survival and growth of Dungeness crab larvae. An understanding of factors affecting survival, particularly during the critical larvae period, will lead to an explanation of perplexing annual fluctuations in crab landings.

MATERIALS AND METHODS

Studies were conducted in glass culture flasks with 200 ml of sea water and five newly hatched larvae (Figure 1). Five waterbaths were constructed and placed in a 36 F cold laboratory to maintain culture flasks at different rearing temperatures (Figure 2). The baths were galvanized washtubs wrapped on the sides and bottom with household wall insulation. Each bath contained 12 gallons of distilled water and was equipped with a thermostatically controlled heating unit, a circulating motor, a suspended grate for flasks, and a maximum-minimum thermometer (Figure 3). The waterbaths were covered with transparent plastic sheets to reduce evaporation. Fluorescent lights in the cold laboratory were turned on every day from 8:00 a.m. to 5:00 p.m.

Salt water in the culture flasks was changed to fresh salt water of the same temperature and salinity regularly, and the presence of dead larvae and cast exoskeletons was recorded (Figure 4). Culture flasks were cleaned with a nylon bristle brush once a week. Crab larvae were fed more barnacle larvae than they could consume between feedings immediately after salt-water changes.

Figure 1. Newly Hatched Larvae from the Abdominal Egg Mass of Female Dungeness Crab Were Placed in Numbered Culture Flasks. A Late Stage Larvae is Visible to the Left of the Number 57 in the Photograph.

Figure 2. Culture Flasks with Larvae Were Maintained in Five Waterbaths at Different Temperatures.

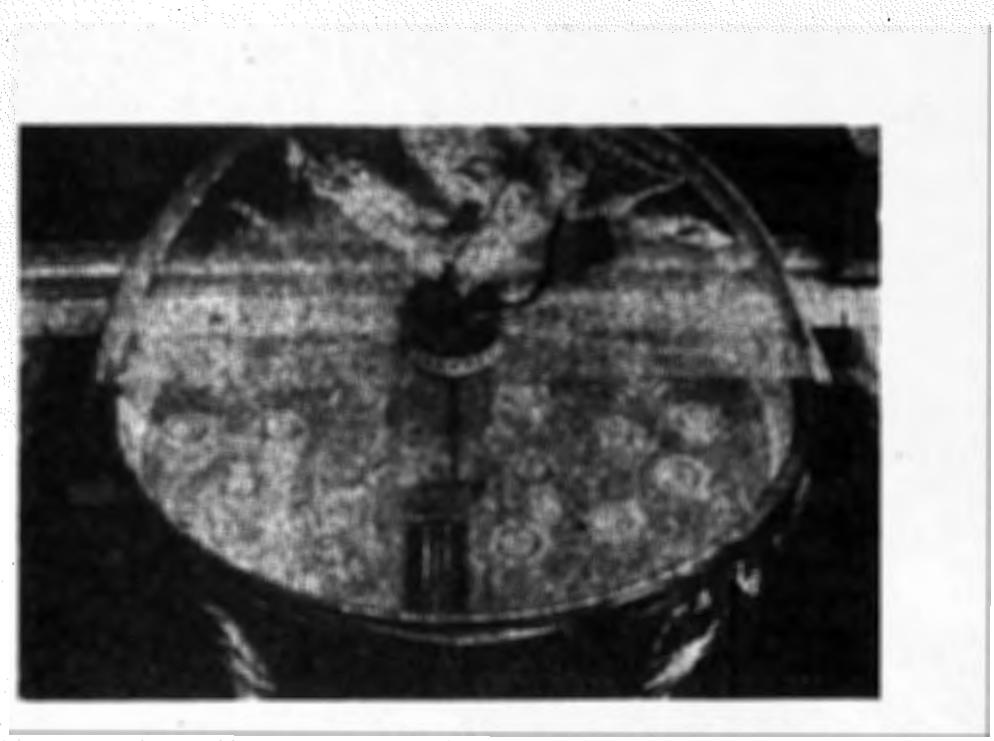


Figure 3. Each Waterbath Contained Culture Flasks with Different Salinities. In Five Waterbaths There Were Many Different Combinations of Temperature and Salinity.

Figure 4. Saltwater in the Culture Flasks Was Replaced with Clean Saltwater of the Same Temperature and Salinity Regularly.

Salt water from Yaquina Bay, Oregon, was filtered and treated with ultraviolet light for the study. Required salinities were made by dilution with distilled water from a glass-lined still.

Newly hatched larvae were gradually acclimated to different test temperatures, but were placed directly into different test salinities. Larval survival and growth were tested with 25 combinations of five temperatures and five salinities. Required temperatures and salinities were 43, 50, 57, 64, and 71 F and 10, 15, 20, 25, and 30 0/00, respectively. Temperatures and salinities were maintained within reasonable limits during the duration of the study (Table 1). Failure of the heating unit in the 57 F waterbath caused a 9 F drop in temperature to 48 F. The problem was corrected within 4 hours and did not appear to effect survival.

RESULTS

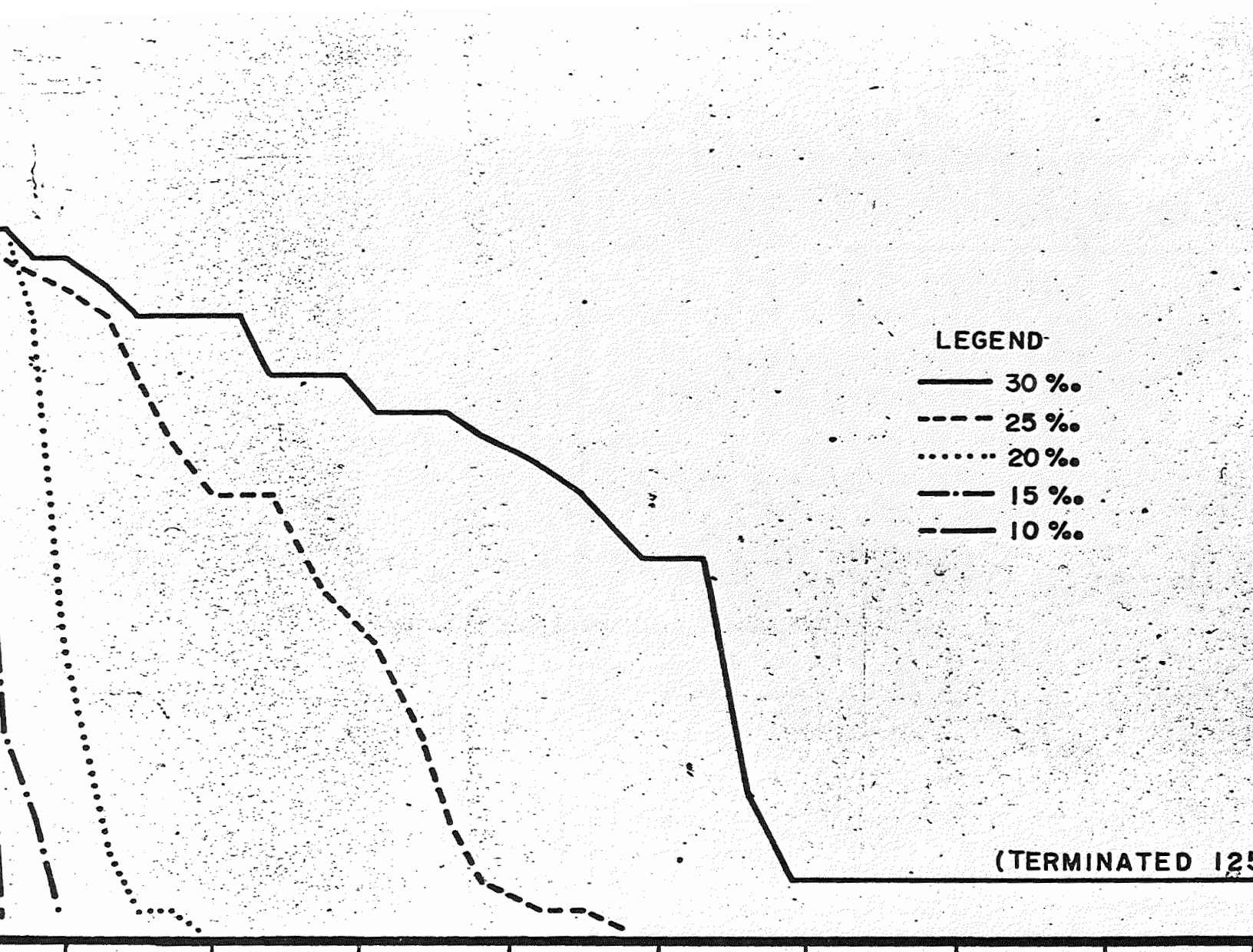
A detailed analysis of data collected during the study is currently in progress and will be published. Salient features of the study are apparent from a graphical summary of survival at different temperature and salinity combinations (Figures 5 through 9). Survival was monitored through the first five zoeal stages to the appearance of the megalopa, but was not carried further because of cannibalism.

Survival at 43 F was poor (Figure 5). By 48 days larvae in all salinities except 30 0/00 had died. After 60 days survival at 30 0/00 was only 8%. None of the larvae completed their development at 43 F after 125 days of rearing.

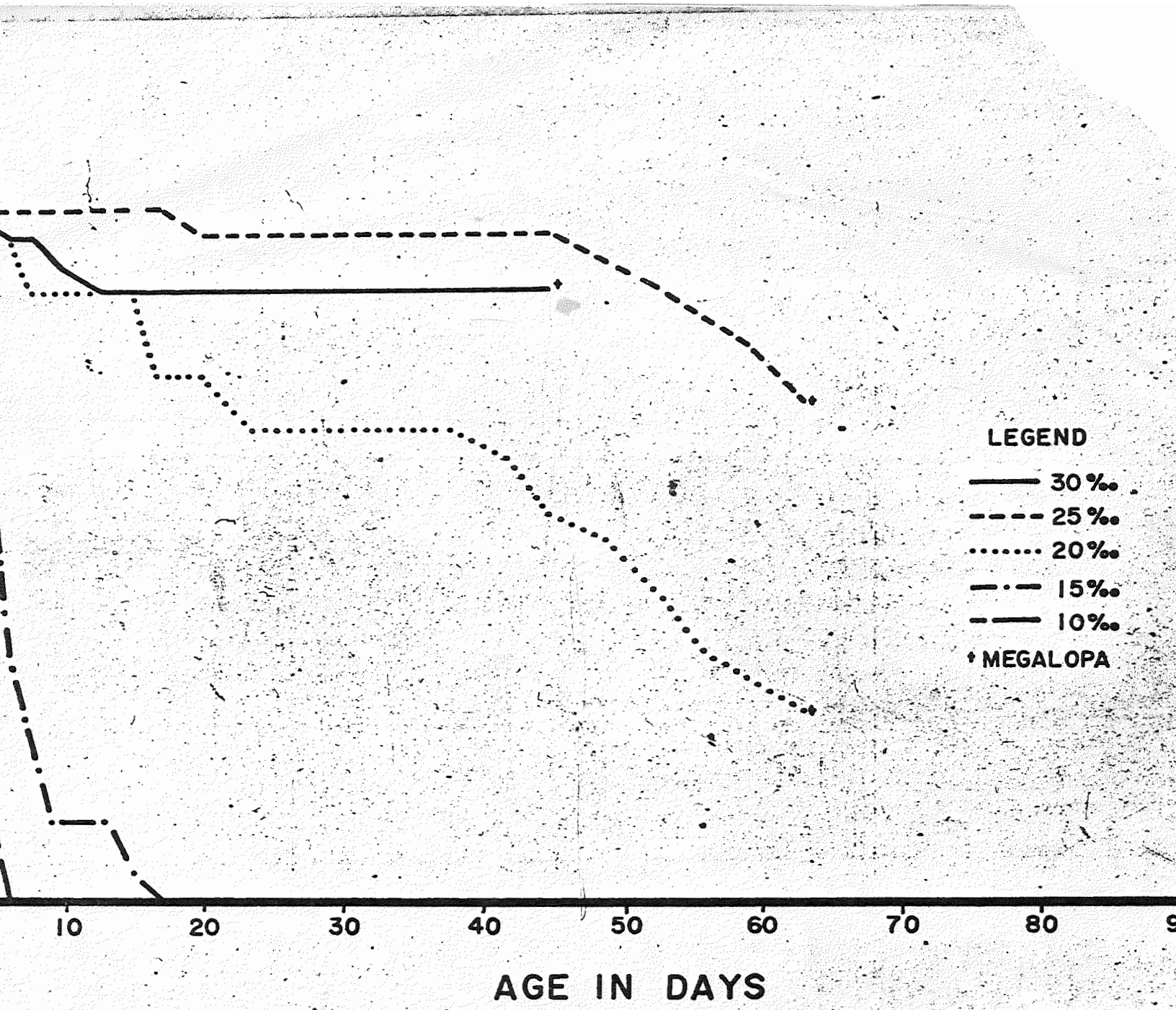
Survival at 50 and 57 F was exceptionally good in 25 and 30 0/00 sea water (Figures 6 and 7). All larvae at these conditions reached the megalopa with 68 to 88% survival. Larvae reared in 20 0/00 sea water reached the megalopa, but survival was below 30%. Sea water below 20 0/00 killed larvae rapidly.

Table I. Ranges in temperatures and salinities.

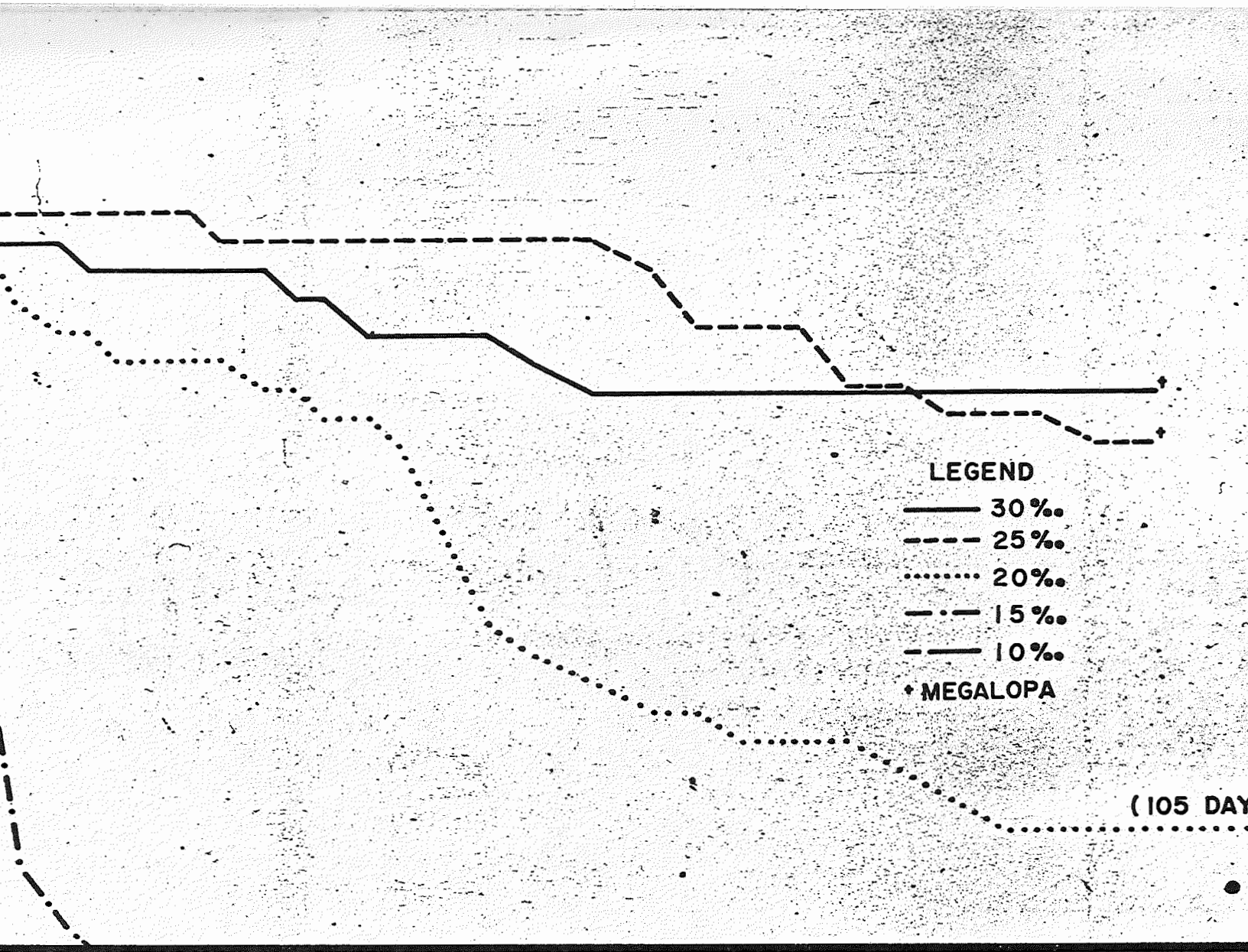
Required temperatures	43 F	50 F	57 F	64 F	71
Temperature ranges	41-44F	47-56F	48-60F	63-66F	70-
Required salinities	10 ‰	15 ‰	20 ‰	25 ‰	30
Salinity ranges ‰	9.9-10.1	14.8-15.0	19.7-21.1	24.3-25.5	27.7



e 5 . Survival of Dungeness Crab Larvae Reared at 43 F in
Salinities.



re 7. Survival of Dungeness Crab Larvae Reared at 57 F in D
Salinities.



6. Survival of Dungeness Crab Larvae Reared at 50 F In Diff
Salinities.