

THE SIZE OF COHO SALMON AND TIME OF ENTRY INTO  
SEA WATER: PART 1 EFFECTS ON GROWTH AND CONDITION INDEX

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The culture of pan-size salmon in Puget Sound waters was initiated on a commercial scale in 1971. Today there are four commercial saltwater farms in Puget Sound and adjacent waters, three use floating net enclosures and one uses earthen-diked lagoon enclosures. For economic reasons, these growers, using temperatures of 12-15°C accelerate the growth of their fingerlings so that they smolt by the first summer after hatching. Growers want their stocks to smolt in time to coincide with high summer temperatures in the growout pens in salt water. If a grower is unable to transfer his fish by early summer or if growth schedules in salt water are not met, he will not be able to harvest in December and January. Since there is not much growth from December to April, the fish farmer is forced into the expense of overwintering. To avoid this, he must depend on accelerated growth in fresh water to provide zero-age smolts at precisely the right time in late spring or early summer.

In an attempt to clear their raceways because of overcrowding or lack of freshwater, growers have occasionally moved coho stocks to saltwater pens when the fish weighed less than 15g each (30/lb). Large portions of these populations have reverted to parr, and suffered higher than normal mortalities, poor growth and poor feed conversion.

From May-November 1973, experiments were conducted to determine what lasting effect, if any, early conversion to salt water would have on zero-age coho salmon. The present study suggests that growth and survival after transfer to salt water are intimately linked with smolting and can be modified by photoperiod even after entry into salt water.

Experimental coho were grown at the Domsea Farms hatchery at Gorst Creek near Bremerton. The stock was obtained from the state hatchery at Skykomish.

The growth of these fish (from a November 1972 egg take) was accelerated so that they were nearly ready to smolt by early May 1973. At that time they were transported from Gorst to the NMFS experiment station at Manchester and placed in fresh water in eight, circular tanks, 100 fish to a container. Average starting weights for the fish in the eight tanks ranged from 9.5-10.5 grams (45/lb).

At approximately three-week intervals throughout the spring, summer and fall months, the fish were anesthetized, weighed to the nearest 1/10 gram and measured for fork length.

Starting on 9 May and every three weeks thereafter, following weighing and measuring, two replicate tanks were switched to full salt water (30 0/00). No attempt was made to acclimate the population to salt water.

By 10 July all fish had been converted to full salt water and were transferred to 4' X 8' X 6' deep net pens at dockside. The presence or absence of parr marks was noted at all weighing periods thereafter.

A majority of the first 200 fish transferred to salt water (average 10.3g each, 44/lb) had not smolted. Almost all of the last group (averaged 19.3g, or 24/lb) had smolted by the time of saltwater conversion as evidenced by loss of parr (Fig 1).

All fish were fed to excess four times daily on Oregon Moist Pellets.

Results of the study showed high mortality (Fig 2) and high percentage of parr-reversal in fish populations averaging 15.0g or less at time of entry into salt water (Table 1). The rates of mortality and reversal to parr (Fig 3) were gradual throughout the experiment. There were no mass mortalities.

Table 1. Mortality and parr-reversal in four lots of zero-age coho, 120 days after conversion to full salt water.

	Size at time of saltwater entry (grams)			
	10.3	12.4	15.0	19.3
Percent Mortality	26	18	11	8
Percent Reverting to Parr	36	32	21	10

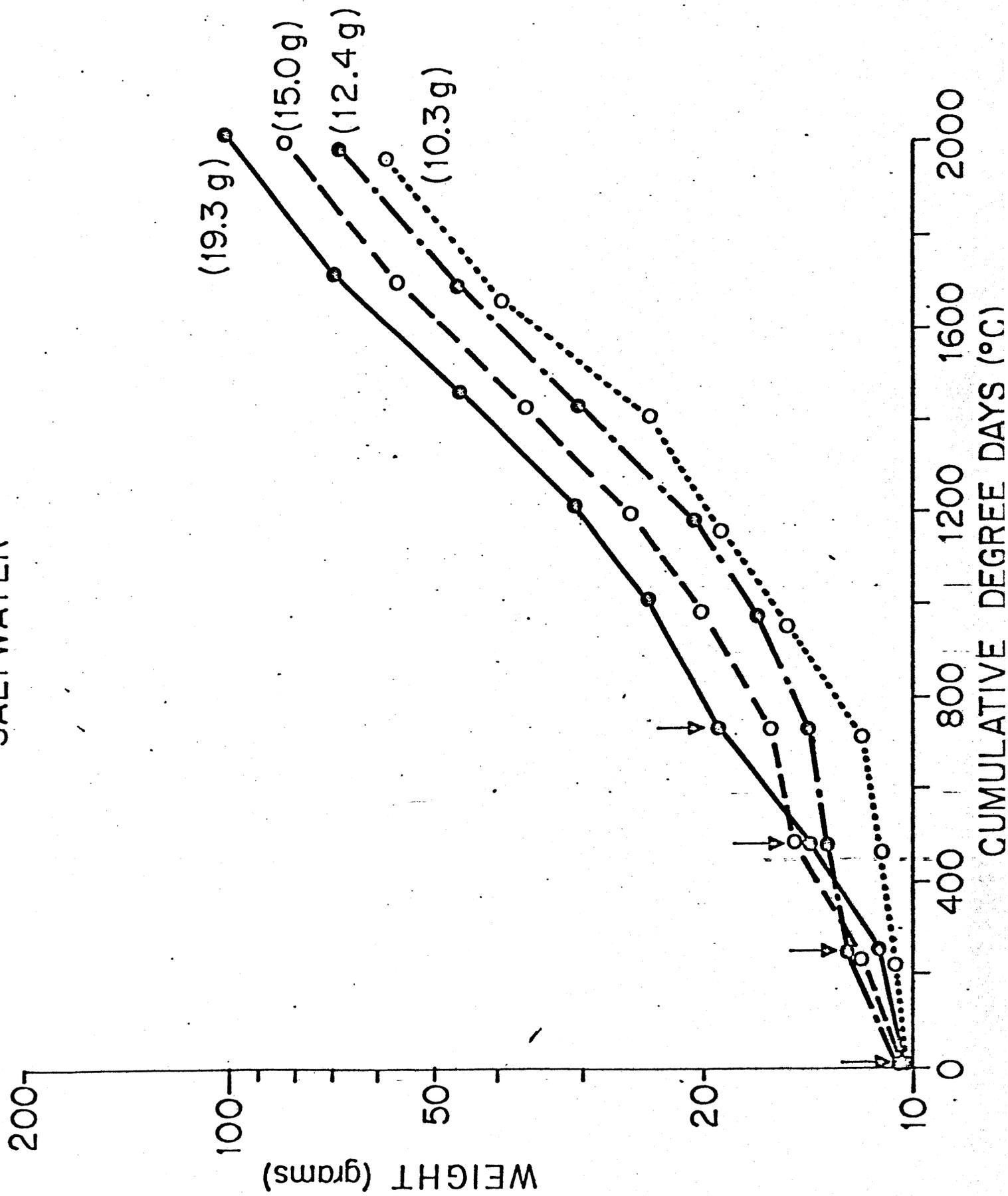
Fish with parr marks at time of conversion to salt water or those later reverting to parr showed nearly no growth in salt water for the duration of the experiment, while fish without parr grew well and at about the same rate in all groups (Fig 4). By November, the average size of all fish with parr was less than 20g size (23/lb), while the average for fish without was about 120g (3.8/lb).

Condition index declined during smoltification in fresh water and was further depressed at time of conversion to salt water (Fig 5). Condition index rose in the fall of the year in all groups.

In all lots larger fish began to exhibit parr marks, by September (Fig 6). By November, some 50-gram fish had parr marks and are believed to have reverted. The fate of these larger parr-reversal fish is not known. We suspect however, that they will also exhibit poor growth and higher than average mortality. It appears that a critical size may have to be attained by the fall months as the photoperiod declines or fish will revert to parr.

# GROWTH OF FOUR LOTS OF ZERO-AGE SALMON IN FRESH AND

## SALTWATER



# SALTWATER MORTALITY OF FOUR LOTS OF ZERO-AGE COHO SALMON

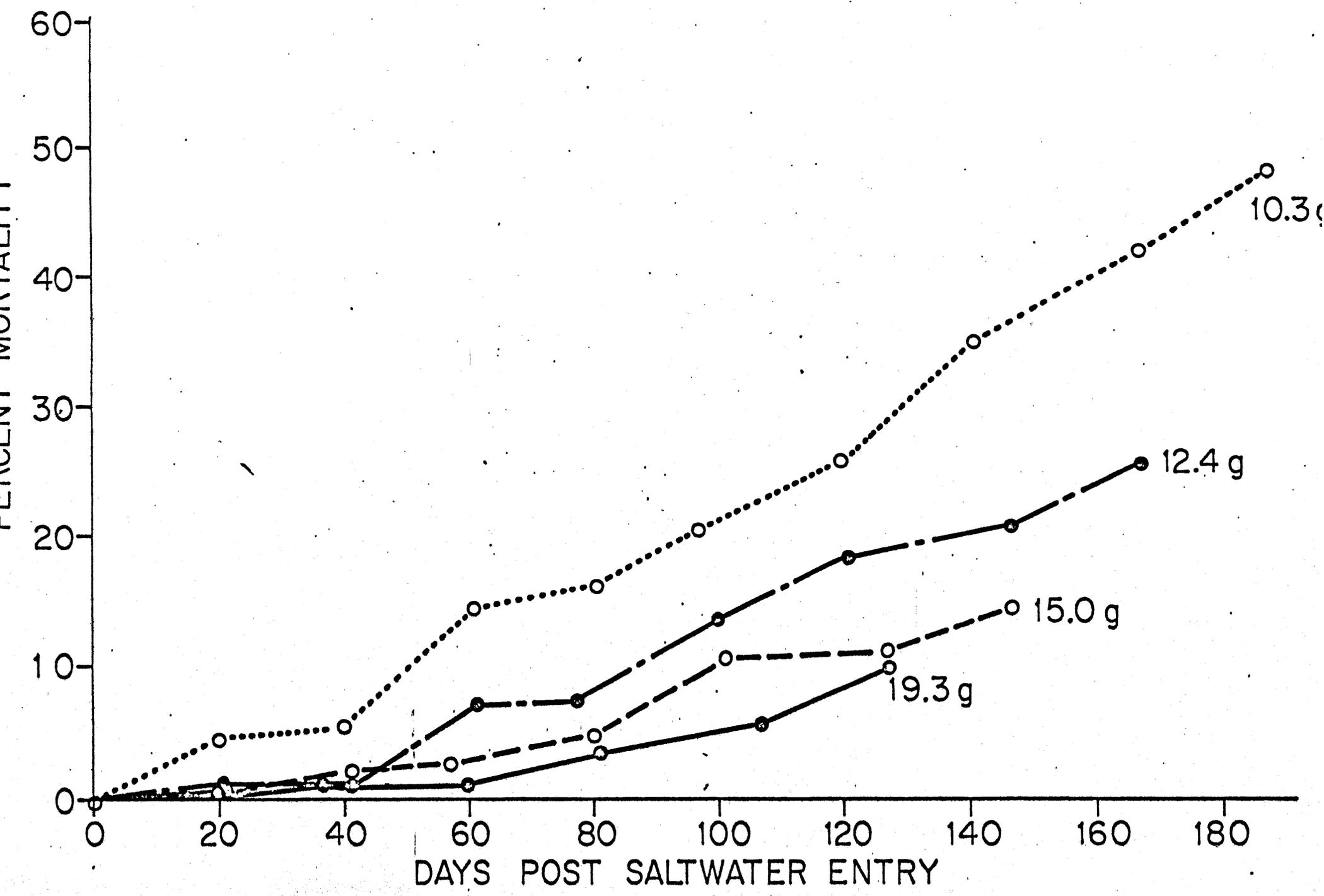
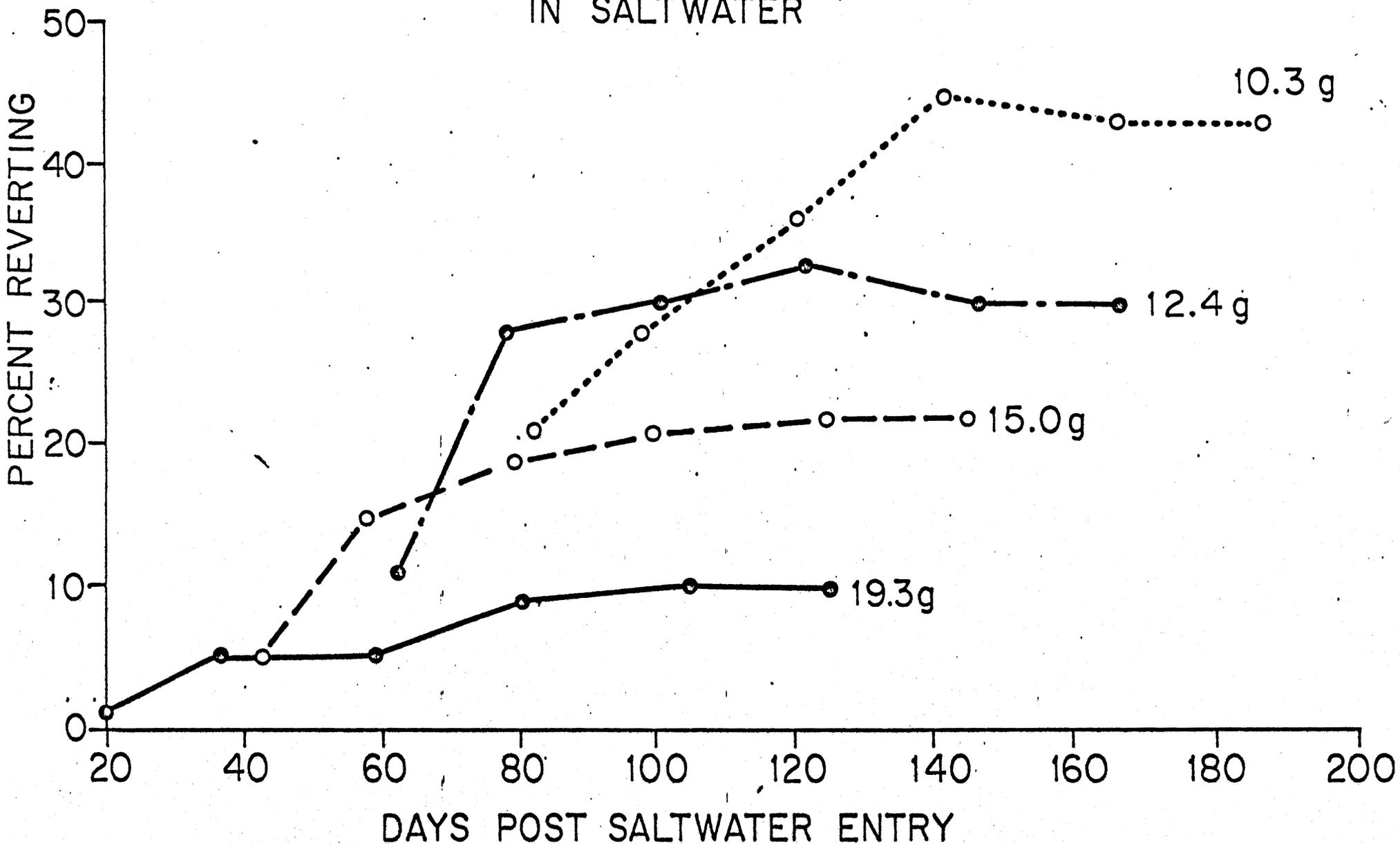


FIG 3.  
PERCENT OF FOUR LOTS OF ZERO-AGE COHO SALMON REVERTING TO PARR  
IN SALTWATER



GROWTH OF PARR AND NONPARR FISH IN FOUR LOTS OF ZERO-AGE COHO SALMON IN SALTWATER

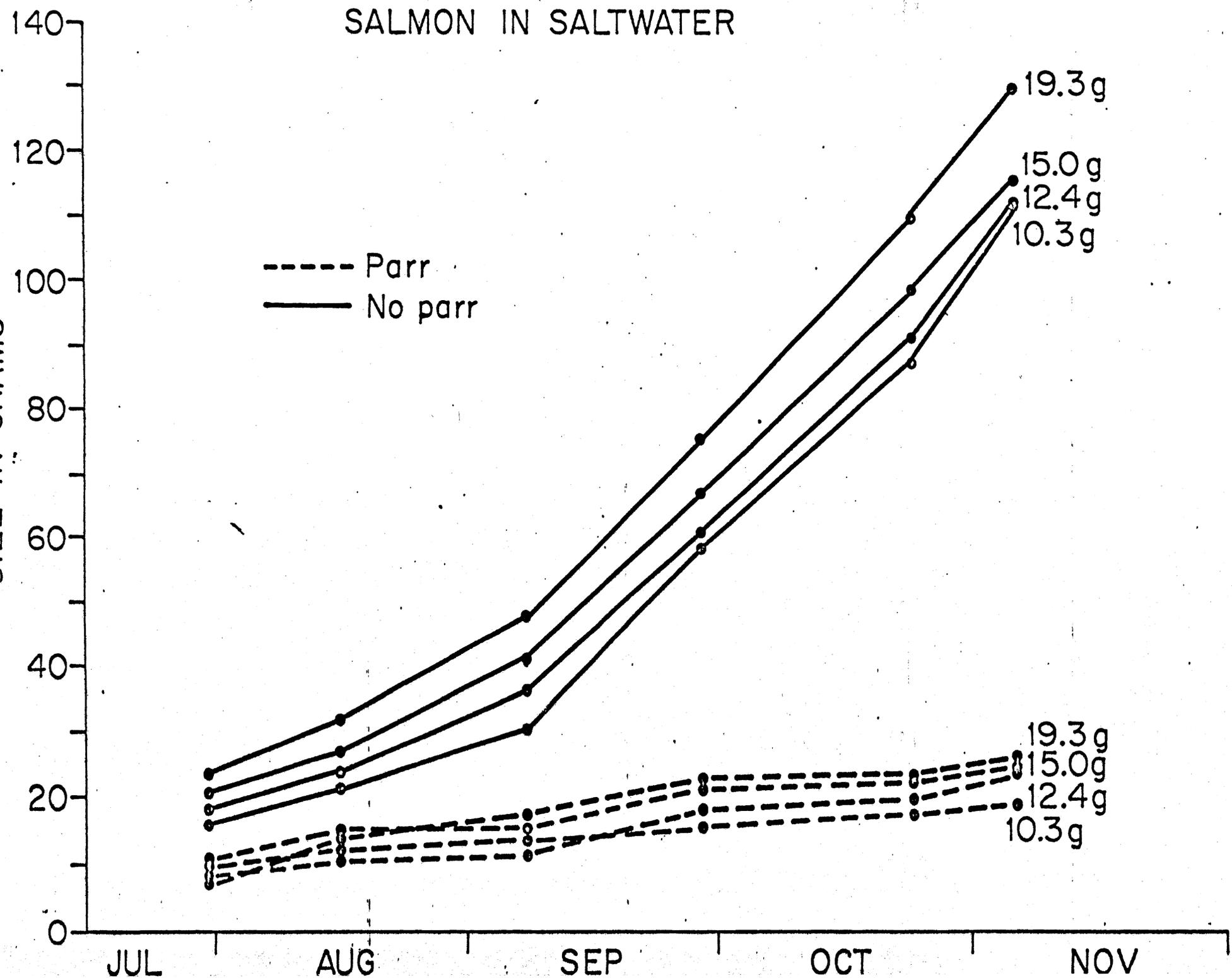


Fig. 5.

# AVERAGE CONDITION INDEX FOR FOUR LOTS OF ZERO-AGE COHO SALMON IN FRESH AND SALTWATER

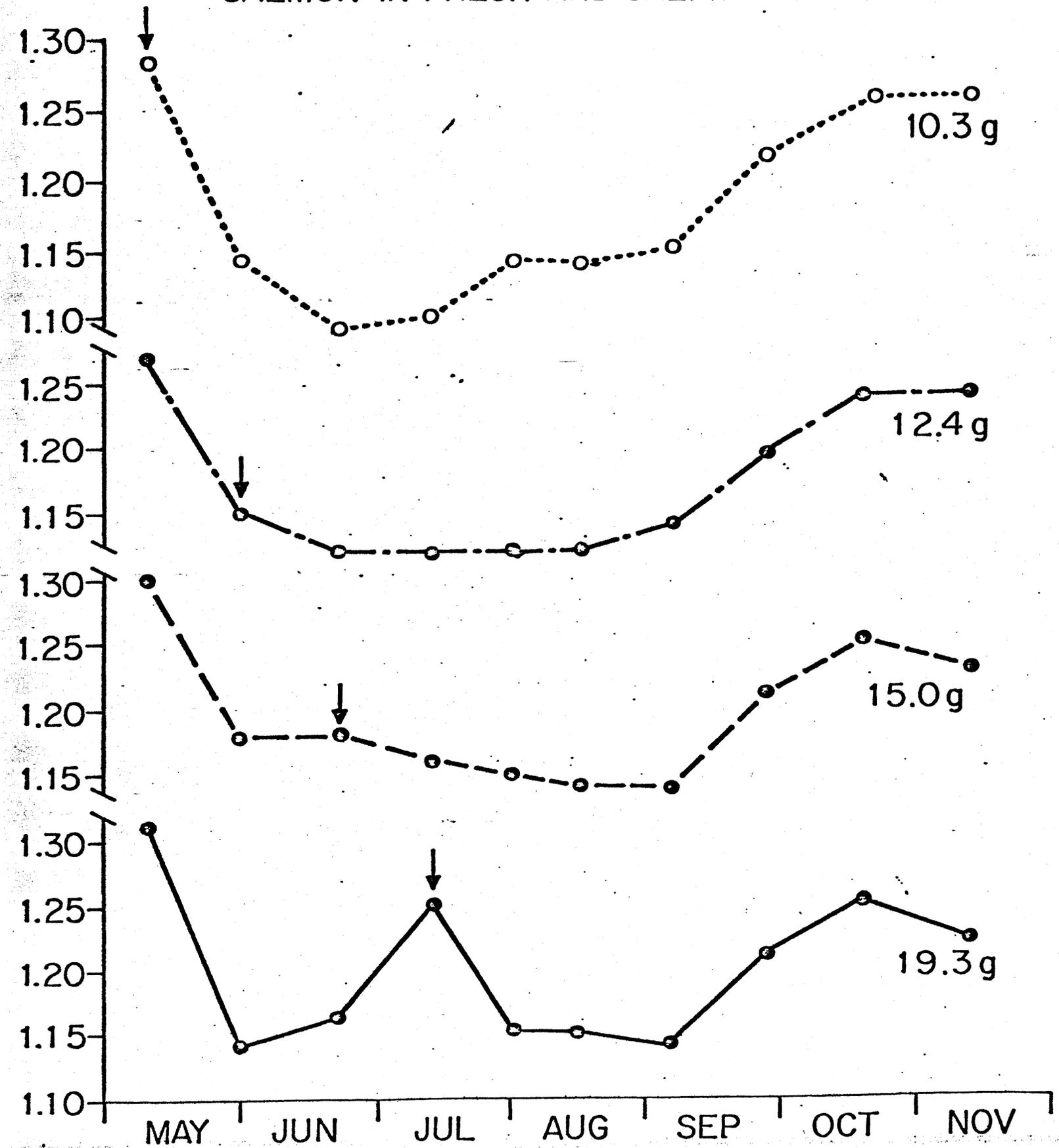


FIG 6.

WEIGHT FREQUENCY OF ALL PARR FISH FROM FOUR LOTS OF COHO SALMON AFTER CONVERSION TO SALTWATER

