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Juvenile Argentine (*Argentina silus*) on the Scotian Shelf

by

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INTRODUCTION

Information on the life history and population dynamics of the Atlantic Argentine (*Argentina silus*) is limited. The general biology and distribution of Scotian Shelf Argentine was addressed by Emery and McCracken (1966) and Halliday (1974). Various aspects relating to the stock assessment were presented by Shevchuck (1973a, 1974, 1976). However studies on growth and ageing of argentine lack information on the early life history stages.

Juvenile argentine less than 10 cm were taken on a joint Canada-USSR silver hake fry survey carried out in the fall of 1980. Information of the size, distribution and vertical migration of juvenile argentine is presented in this paper.

METHODS

The Russian vessel 60-LET VLKSM was used for the survey. The main intent of the survey was to investigate the distribution and abundance of silver hake juveniles. The survey methodology is given by Koeller (1981).

Survey stations were predetermined random stratified, chosen from strata 60-78 of the standard Maritime groundfish survey (Halliday and Kohler, 1971). These strata had the greatest abundance of silver hake in similar surveys conducted in the two previous years. The Soviet fry trawl equipped with a headline transducer was used. Tows were 30 minutes in duration and the trawl was towed 2-4 m off bottom.

Five stations were selected for vertical distribution studies. The selected stations produced more than 100 silver hake fry during a regular survey set. A vertical profile was completed at each station using 4 depth ranges: A - near bottom as in the regular survey; B - 6-20 m; C - 20-40 m; D - 40-60 m, 60-100 m, 100-150 m off bottom. Each set consisted of a 3 step oblique tow with 10 minutes at each level. Each profile was conducted either entirely at night or entirely in daylight.

A number of 3 step oblique tows were also done. These covered the entire water column with 10 minutes near bottom, midwater, and at the surface.

During the cruise all fish less than 10 cm were measured to the mm above. Larger fish were measured to the nearest cm.

RESULTS

Survey

The distribution of survey stations and the associated catches of argentine are shown in figure 1. A total of 68 juveniles and 16 adults were caught in the survey. Juveniles were taken at depths of 100-200 m in the area surrounding La Have and Emerald Basins. The largest catches were on Sambro Bank. Adults were taken at depths in excess of 200 m in the north east corner of Emerald Basin and on the shelf edge south of La Have Basin.

Evidence of diel migration of juveniles was found in the survey (figure 2). Catches were combined in 3-hour intervals and the percent of sets with argentine was plotted against time. Peak catches were at sunset and sunrise with no catches in the daylight hours and a reduced catch in dark hours.

Vertical Distribution Study

A total of 9 vertical stations were occupied in the survey. These stations were chosen on the basis of producing greater than 100 silver hake juveniles in the regular survey so they are not expected to produce large numbers of argentine. However a total of 51 argentine were taken and the results were combined in 3-hour intervals and presented in figure 3.

Argentine were taken in the water column at night but never were caught in the water column during daylight hours. While sampling at each depth interval was insufficient to state conclusively the timing of the vertical migration figure 3 indicates that the fish rose off the bottom at approximately 21:00 hours. They reached the peak of migration at 02:00 and returned to bottom at 05:00 hours. The migration cycle peaked in level D (40-60 m off bottom) but 4 individuals were taken in level E (60-100 m off bottom). The time of ascent and descent through level A corresponds with the time of peak catch in the regular survey (figure 2).

Juvenile Growth

The length frequency of all juvenile argentine taken by the 60-LET is presented in figure 4. A total of 150 juveniles were caught and the mean length was 67.2 mm. According to many authors (Shevchuk, 1976; Emery and McCracken, 1966) hyaline zones on the otolith are formed in mid autumn. Thus data from this survey indicates a length of 67 mm at the time of formation of the first annulus. Lengths of larval argentine caught in the Scotian Shelf Ichthyoplankton Survey conducted by Fisheries and Oceans, Canada was obtained from Huntsman Marine Laboratory, St. Andrews, N.B. There are records of 6 argentine taken on various surveys since August, 1977. The date of captures and length of these fish is presented in table 1 along with the mean length of juveniles taken in this survey. These data are plotted in figure 5. From these few points it appears that argentine larvae undergo linear growth at a rate of .33 mm per day for at least the first 7 months of life. According to Bigelow and Schroeder (1953) argentine hatch at a length of 7.5 mm. Thus, figure 4 indicates that peak hatching occurs sometime in mid April.

DISCUSSION

The variation of argentine length with depth observed in this survey agrees with that observed by Emery and McCracken (1966). The juveniles were taken in depths from 100-200 m and adults were taken from over 200 m.

Within the survey area argentine juveniles were taken from the shallows surrounding Emerald and La Have Basins with the greatest catches on Sambro Bank, between the two basins. The distribution of catches from Canadian research vessel cruises on the Scotian Shelf (Scott, 1976) and data presented by Shevchuk (1973b) indicate that these are three major areas of adult distribution, namely in the Fundien Channel (Div. 4X); south and east of Sable Island (Div. 4Vs and 4W); around Emerald and La Have Basins and south to the shelf edge (Div. 4W and 4X). The area covered by this survey is restricted to the latter area.

The evidence of diel migration of argentine juveniles presented here agrees with that presented by Koeller (1981) for silver hake. Argentine were most avail-

able to the gear about 3 hours after sunset and just prior to sunrise. Figure 3 indicates that this is when the fish rise off bottom and return to bottom. The trawl was towed 2-4 m off bottom and it is suggested that during daylight hours the argentine were on the bottom and unaccessible to the gear.

The mean length of argentine taken in this study indicate a length at first annulus formation of approximately 70 mm. According to the ageing convention of Jensen (1965) this should correspond to length at age 1. Shevchuk (1976) considered the second unique ring on the otolith which forms at a length of 100 to 160 mm to be the first annulus. However the linear growth series presented in figure 5 of this paper shows that the first annulus would occur at a length of around 70mm.

Otoliths from specimens of juvenile argentine taken in this survey will be used for age validation studies. Also further information on all distribution and early life history of argentine will be gained from additional juvenile surveys.

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Table 1. Date of capture and length of argentine larvae and juveniles.

DATE	LENGTH (MM)	CRUISE	SOURCE
08/08/77	43.0	CL01	SSIP
08/08/77	44.0	CL01	SSIP
28/08/78	52.0	H006	SSIP
08/06/78	28.5	CC02	SSIP
10/07/78	37.0	CC02	SSIP
24/06/80	25.0	H036	SSIP
14/10/80	67.4	60-LET	(THIS STUDY)

Results of regression

Length (mm) = .33X - 27.48 r = .9811
 where X = day of the year.

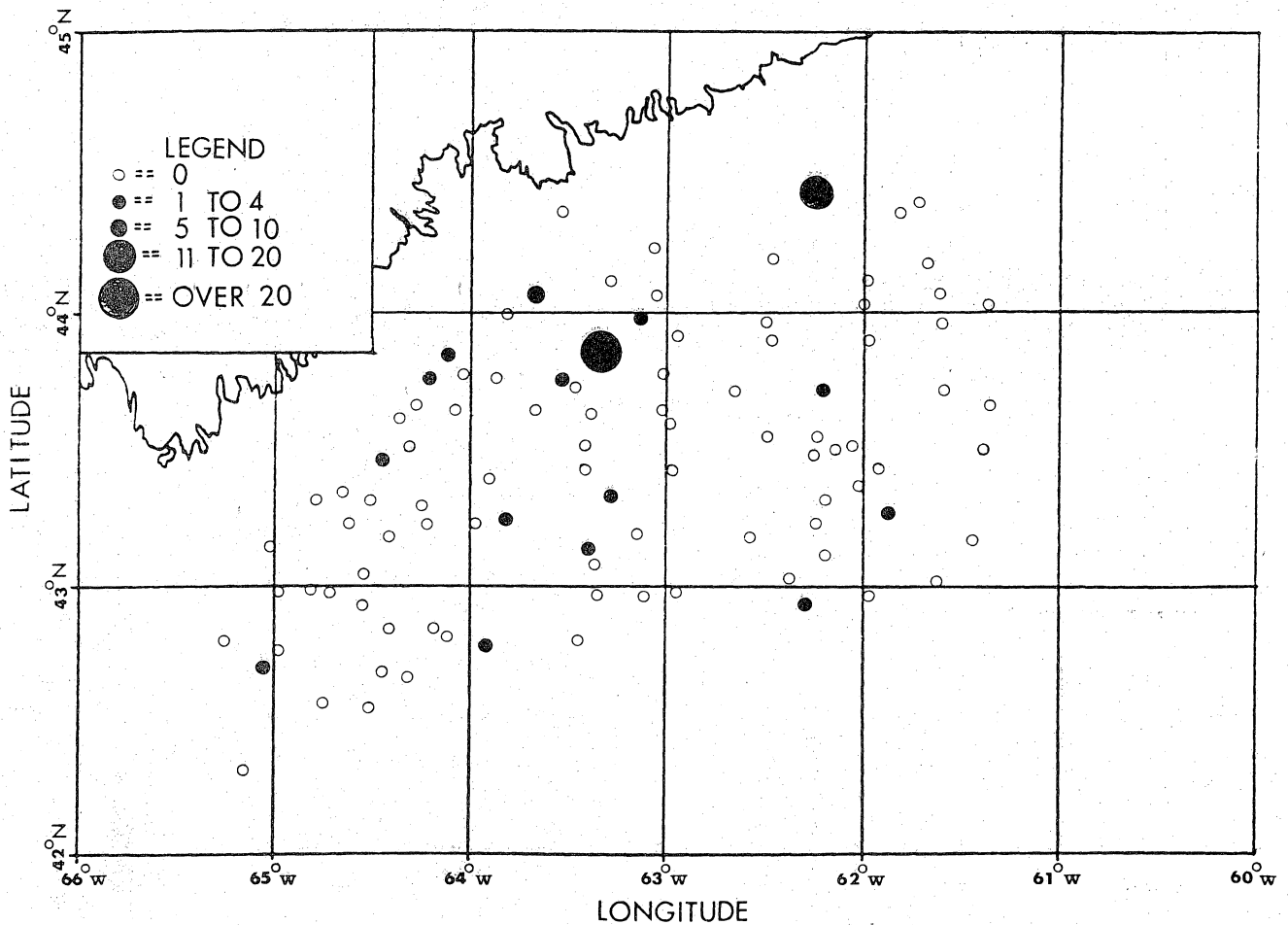


Figure 1. Distribution of survey stations and catches of argentine during the silver hake fry survey September 26 - November 3, 1980.

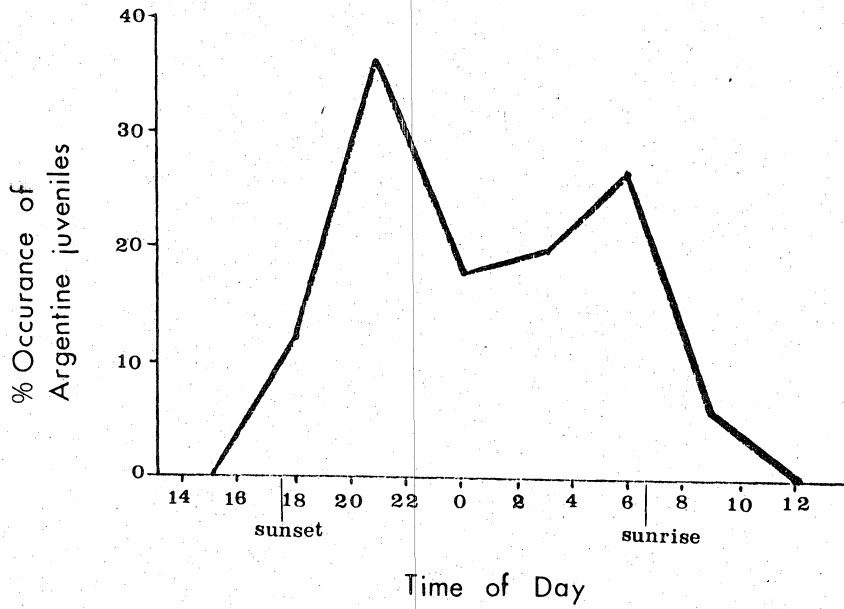


Figure 2. Percent occurrence of argentine juveniles in regular survey stations.

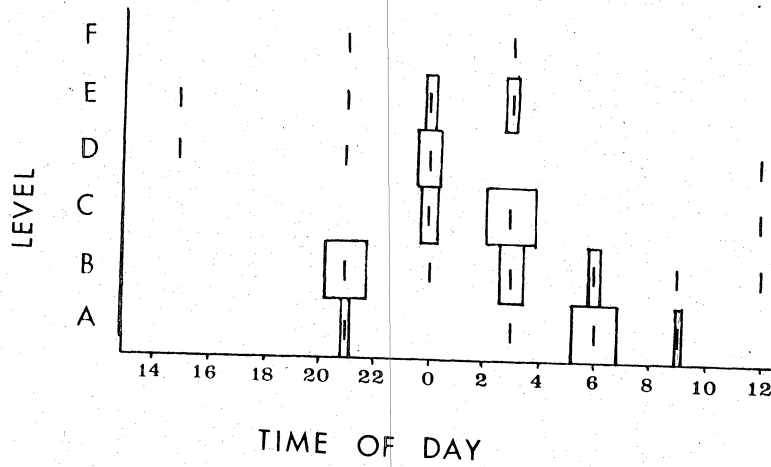


Figure 3. Vertical distribution of argentine juveniles from nine vertical stations. The boxes indicate numbers per tow and the vertical bars indicate time periods and depths where at least one tow was made.

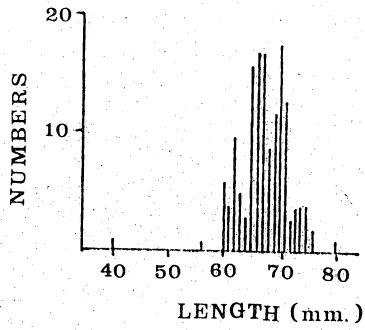


Figure 4. Length frequency of all argentine juveniles taken in this study.

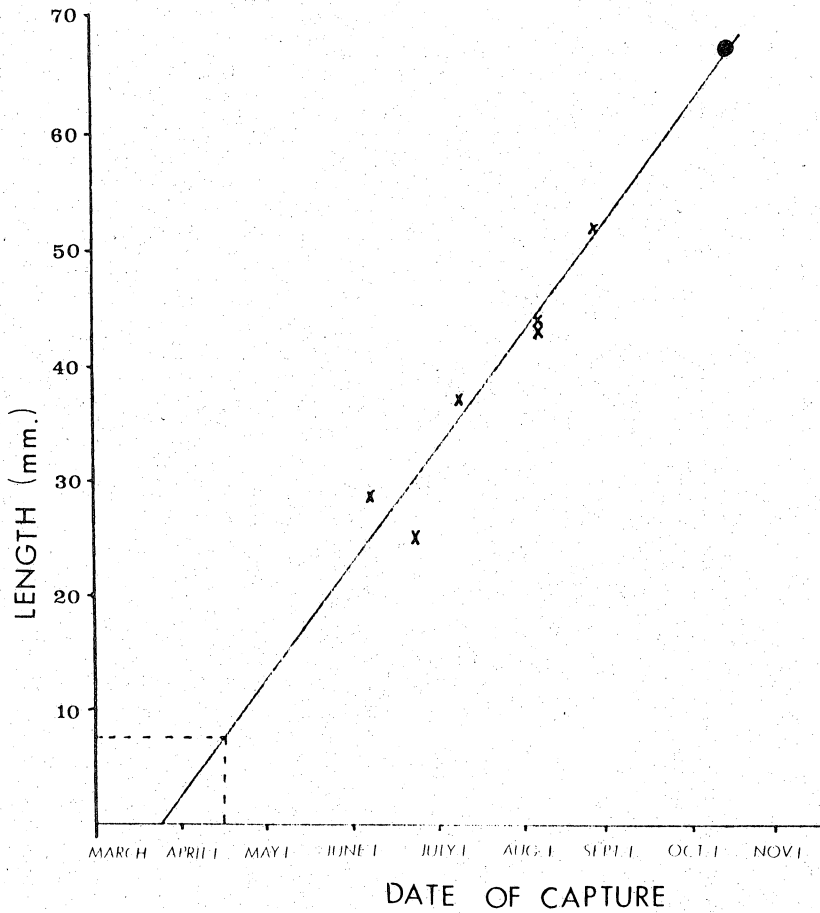


Figure 5. Growth of 0+ argentine. "x" indicates data obtained from Scotian Shelf Ichthyoplankton Surveys and "●" is the mean length obtained in this study.