

Relationships among otolith height, otolith length
and body length in Arctic cod, Boreogadus saida
(Lepechin), from Labrador

by

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INTRODUCTION

Otoliths found in the digestive tracts of predators can be used in identification of the prey and estimation of the original size of the prey. The otolith of Arctic cod, Boreogadus saida (Lepechin), is illustrated in a key to the fishes of the Gulf of Alaska, Bering Sea and Beaufort Sea (Morrow, 1979). However, to the author's knowledge, there is no published information on the relationship between otolith size and body size. The present study provides this information for Arctic cod collected in the northwest Atlantic off Labrador.

Morrow's (1979) key does not include Arctogadus glacialis and A. borisovi, two Arctic gadoids similar to B. saida. It has been suggested (J. Boulva and J.G. Hunter, pers. comm.) that the ratio of otolith height to otolith length might be useful in distinguishing between the two genera. This paper provides height: length ratios for otoliths of B. saida.

MATERIALS AND METHODS

Arctic cod, Boreogadus saida, were collected on research cruises of the R/V Gadus Atlantica off Labrador in September-October of 1978. Specimens were frozen onboard ship and thawed in the laboratory for examination. The fork length of each fish was measured to the nearest mm, and the otoliths were removed and stored dry.

Fifty-six fish, ranging in length from 46 mm to 285 mm, were selected for the present study. One otolith was chosen randomly from each fish, and its length and height (Morrow, 1979) were measured to the nearest 0.05 mm with vernier calipers.

Regression equations expressing the relationships between variables were calculated by the method of least squares.

RESULTS AND DISCUSSION

Otolith size and body size

The increase in otolith length and otolith height with increase in body fork length (FL) is shown in Fig. 1. Otoliths of the smallest fish (46-58 mm) are much smaller relative to body length than otoliths of larger fish. These smaller fish were young-of-the-year. All others were age one or older. It is not known if the smaller otoliths in the young-of-the-year result from a systematic error in measuring fork length, or if there is a real curvilinear relationship between otolith size and body size, with the curvature being most pronounced in fish less than 75 mm FL. A curvilinear relationship between otolith length and fish length has been found in the northern sand lance, Ammodytes dubius (Scott, 1973).

For those fish greater than 65 mm FL, the relationship between otolith length (OL, mm) and fork length (FL, mm) is

$$OL=0.0378 FL+0.277 \quad (N=49; r^2=0.972)$$

and the relationship between otolith height (OHt, mm) and fork length is

$$OHt=0.0112 FL+0.783 \quad (N=49; r^2=0.960)$$

Otolith height: length ratio

The otolith of the Arctic cod becomes elongated as it grows (Fig. 2). The relationship between otolith height and otolith length may be described by the allometric equation.

$$OHt=0.637 OL^{0.763} \quad (N=56; r^2=0.988)$$

The ratio of height to length, calculated from this equation, decreases from 0.64 in an otolith 1 mm long to 0.35 in an otolith 12 mm long. Values actually recorded in this study ranged from 0.60 to 0.33 (Fig. 2). Comparable information for Arctogadus spp. is not yet available.

ACKNOWLEDGEMENTS

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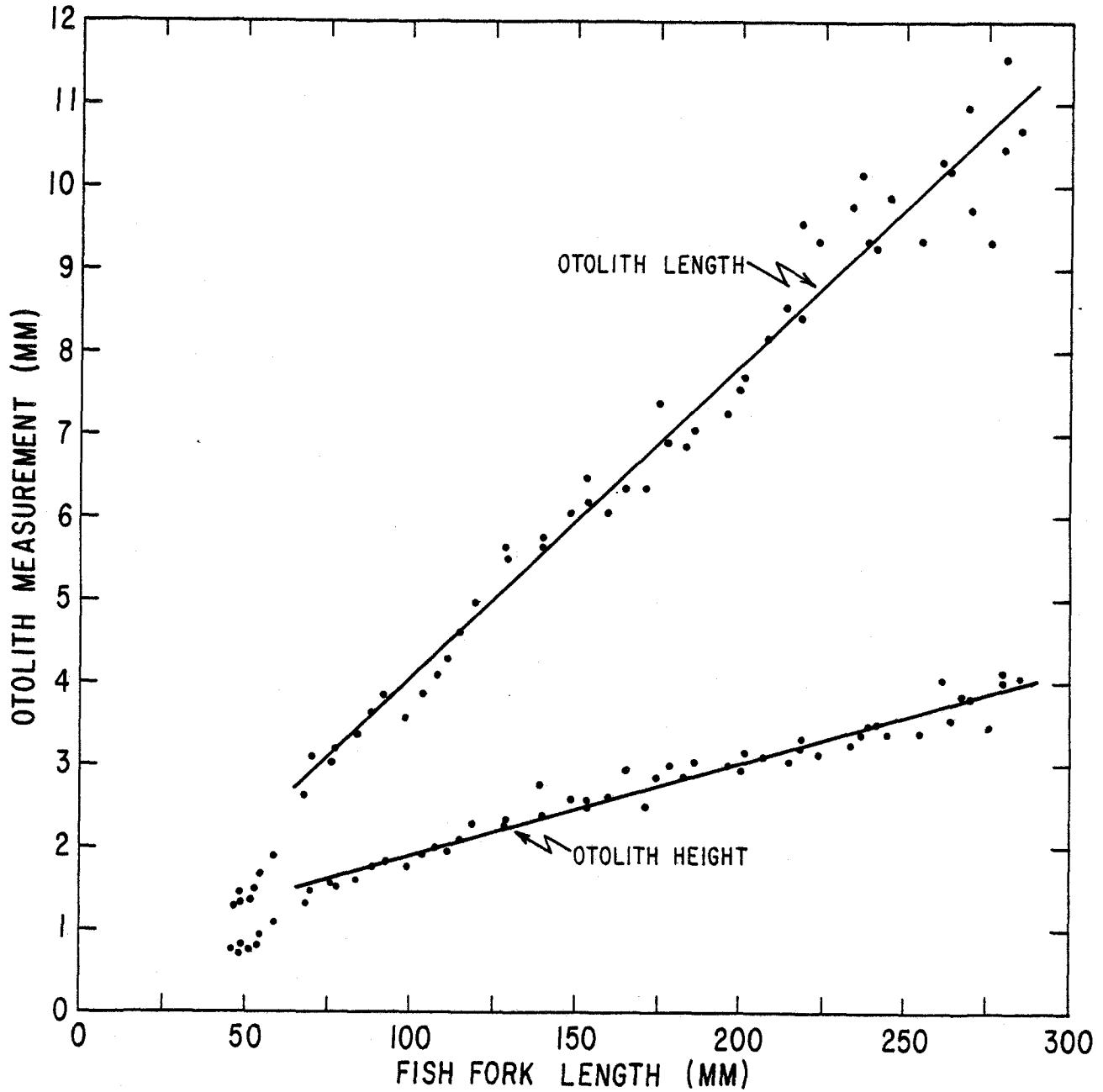


Fig. 1. The relationships between otolith size (length and height) and fork length in Boreogadus saida.

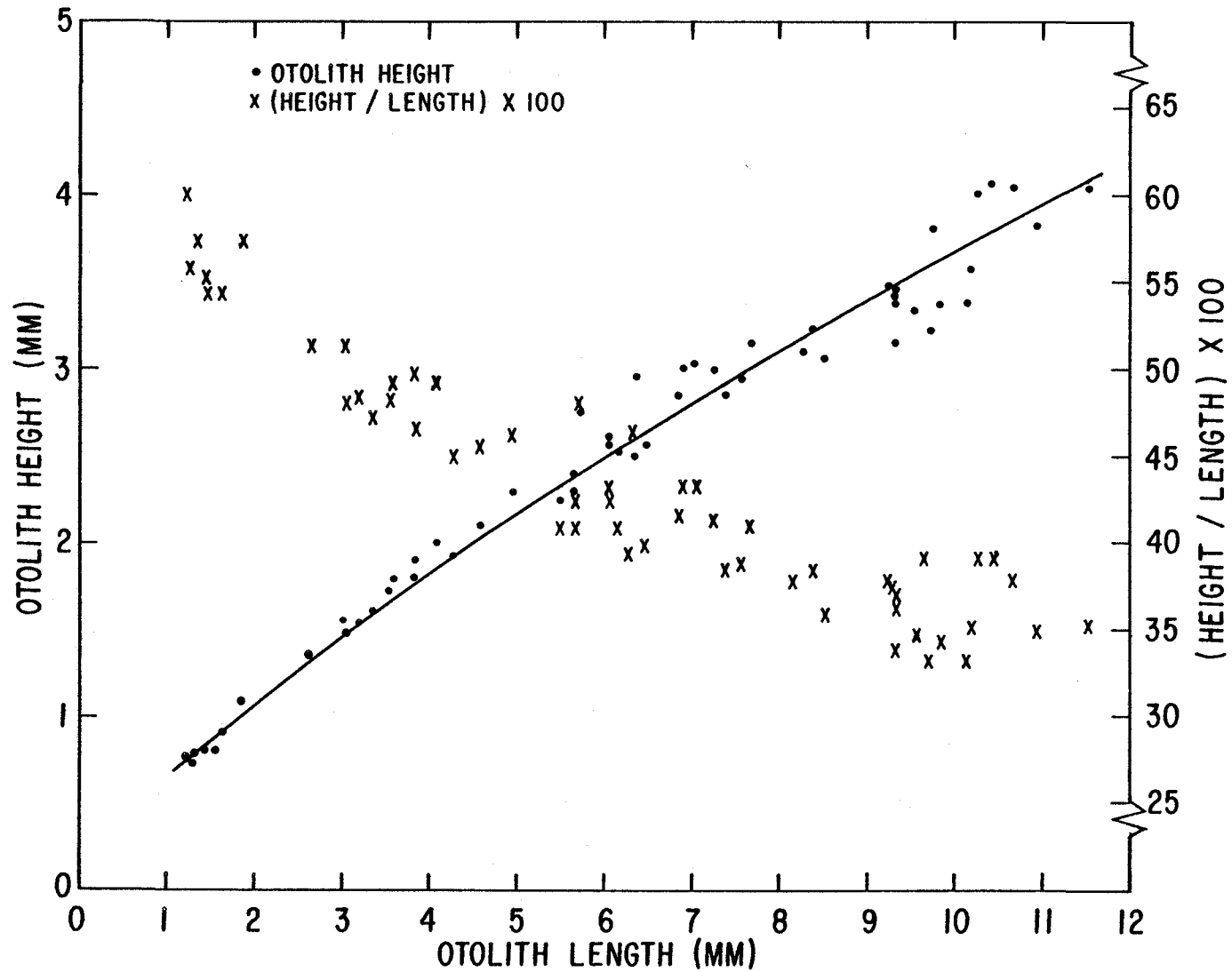


Fig. 2. The relationship between otolith height and otolith length in Boreogadus saida.