

# Temporal Variability of Maturity and Spawning Biomass in Cod (*Gadus morhua*) in NAFO Divisions 2J+3KL\*

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## Abstract

The maximum likelihood method was used to construct maturity ogives for cod (*Gadus morhua*) in NAFO Div. 2J and 3K from 1978 to 1990, and in Div. 3L from 1981 to 1990, from autumn research vessel sampling data combined with results from sequential population analysis to estimate the spawning stock number and biomass each year. The means of water temperature at 150 m and 175 m at Oceanographic Station 27 off Newfoundland were taken for the 5 months: April to July and September.

There was a spatial trend in length at 50% maturity with northernmost fish (Div. 2J) maturing at the smallest size and southernmost fish (Div. 3L) maturing at the largest size. The spatial trend in the age at 50% maturity was not as clear, but the age at 50% maturity in Div. 3L was larger than that in Div. 2J in 7 of 10 years and in Div. 3K in 8 of 10 years, respectively (Table 1).

TABLE 1. Length of cod at 50% maturity obtained from the logistic equation.

Year	Length at 50% maturity (cm)			
	Div. 2J	Div. 3K	Div. 3L	Div. 2J+3KL
1978	53.71	60.64	–	–
1979	52.25	53.32	–	–
1980	53.01	55.06	–	–
1981	55.53	54.79	54.40	54.85
1982	54.25	55.89	57.23	55.97
1983	54.65	55.97	58.79	56.56
1984	49.41	52.89	58.86	52.17
1985	48.32	51.28	55.06	50.56
1986	48.09	50.45	57.52	52.04
1987	47.87	51.60	56.67	50.91
1988	48.39	49.57	50.22	49.25
1989	48.39	50.31	50.88	49.75
1990	45.87	49.75	55.02	49.72

The age at 50% maturity did not show a temporal trend, but the length at 50% maturity showed a declining trend over time in all three divisions.

Likelihood ratio tests showed that the age at 50% maturity changed very significantly from year to year in the period from 1981 to 1990, and that the length at 50% maturity sometimes changed very significantly, especially between 1982 and 1986.

Variations in maturity were studied in relation to water temperature and stock abundance but definitive results were not obtained. Temperature, however, seemed to have a 2-year lagged effect on cod maturity, and an optimum temperature for maturation may exist. Cod biomass seemed to have a 1-year lagged effect on maturity and high biomass in one year may reduce the proportion mature or increase the age at 50% maturity in the following year. A

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graphical analysis suggested that the biomass had very little effect on maturity when the temperature was low, and had a positive relationship with the age at 50% maturity when temperature was high (Fig. 1).

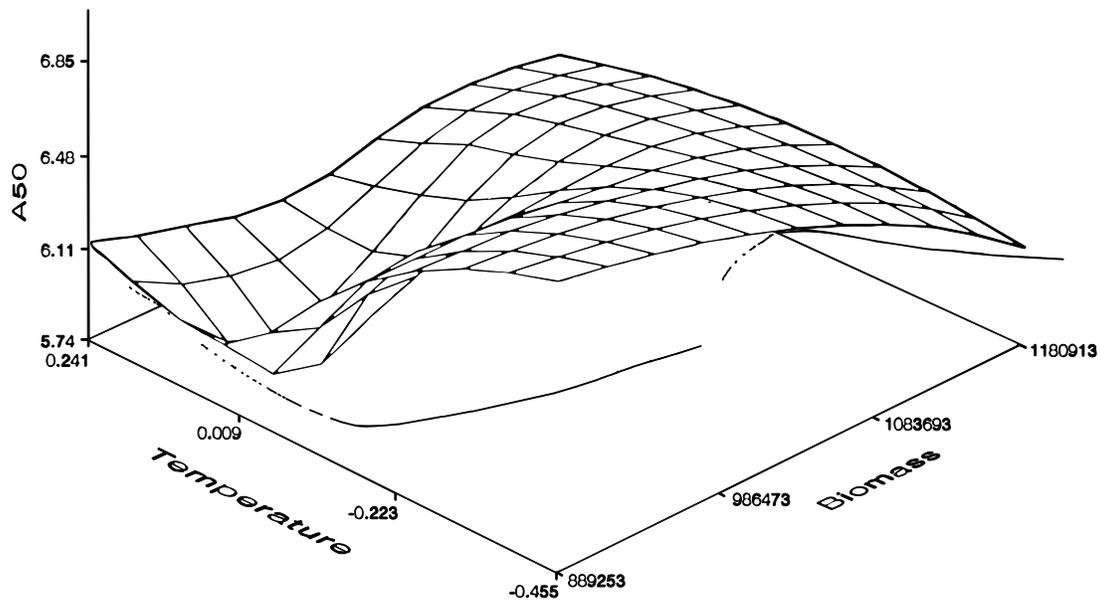


Fig. 1. Relationships between age at 50% maturity, biomass one year earlier and temperature two years earlier, derived from multiple correlation.

*Key words:* Cod, *Gadus morhua*, maturity ogives, maximum likelihood method, NAFO Divisions 2J3KL, spawning biomass