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Variability in Fecundity and Total Egg Production for West-Nordic Greenland Halibut

by

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Abstract

The West-Nordic stock of Greenland halibut comprises Greenland halibut distributed in the waters of East Greenland, Iceland and Faeroe Islands. Stock dynamics, reproduction and recruitment for this stock are poorly described. Fecundity may be an important contribution in the understanding spawning-stock - recruitment relationships. Changes in fecundity may contribute to recruitment variability, and fecundity is for some species described to act compensatory with a response to stock size. Fecundity-length-relationship has been published for Greenland halibut in East Greenland waters for 1997.

The present paper presents fecundity – length relationships for Greenland halibut in East Greenland for the years 1998-2000. Relationships for 1997-2000 are compared to study possible annual variation. The relationships are compiled and raised to population level to study possible relationships between spawning stock size and recruitment as obtained from the XSA.

Keywords: Greenland halibut, West Nordic Stock, Fecundity, Total egg production.

Introduction

Greenland halibut is a deepwater flatfish, widely distributed in both the North Atlantic and the North Pacific. The relationship between Greenland halibut in the different areas is not known. For management purposes the stock has been divided in several management units. Greenland halibut in the waters of East Greenland, Iceland and Faroe Islands constitute a management unit in the ICES system, and is often referred to as the West-Nordic Greenland halibut.

The biology and stock dynamics is poorly understood. The main spawning area is believed to be located south and west of Iceland (Magnusson 1977). In recent years spawning has been observed in East Greenland waters (A. Gundersen unpublished data) and at Munkagrunn, Faroe Islands (9 running females observed in 2001; L. H. Ofstad, unpublished data).

Catches of West-Nordic Greenland halibut increased during the 1980s to a maximum of about 61 000 tons in 1989. Then catches stabilised around 30 000 -40 000 t until 1997. In 1998 catches dropped to 20 000 t.

The biomass of several of the stocks has decreased and strong regulations of the fishery have been set into force.

Materials and Methods

Individual potential fecundity was obtained using the method described by Bagenal and Braum (1978), with adjustments for Greenland halibut (Gundersen *et al*., 1999). Fecundity was estimated and related to total length for each sampled individual (log-regression).

Ovaries were collected in East-Greenland waters from:

- longline catches in August in 1997 and 2000
- trawl catches in August 1998
- trawl catches in February-March 1999

Spawning stock size was calculated based on:

- stock in numbers from the assessment (XSA, ICES Northwestern Working Group 2000)
- sex composition
- maturity oogives

Total egg production (TEP), was obtained by combining stock size and fecundity-at-age using fecundity-at-length and mean-length-at-age.

Results

Individual potential fecundity ranged from 9 400 to 277 000 oocytes per female (Fig. 1) and variation between years was observed. Fecundity to length relationships were estimated using log-regression and given as (F in 1 000):

1997	F = 5.16 *10-6 * L 3.75 (Gundersen *et al*., 2001).
1998	F = 5.19 *10-6 * L 3.75
1999	F = 1.06 *10-3 * L 2.41
2000	F = 2.89 *10-5 * L 3.31

Length-based fecundity was much lower in 1999 than in the other years. This year sampling was conducted in late winter, and ovaries were partly in spawning condition (GSI up to 19%). Therefore F-L-relationship for 1999 may be biased.

Back calculated TEP was based on F-L-relationship for 1997 (Gundersen et al. 2001) and 2000, and was in the range 2.3*1011 - 7.4*1011 per year (Fig. 2).

Looking at TEP estimates from the 1997 F-L- relationship, age groups 10-13 contributed to 40-70% of the TEP of the spawning stock (Fig. 3).

Females older than 15 years contributed mainly to 5-15% of TEP, ranging up to a maximum of 25% in 1997.

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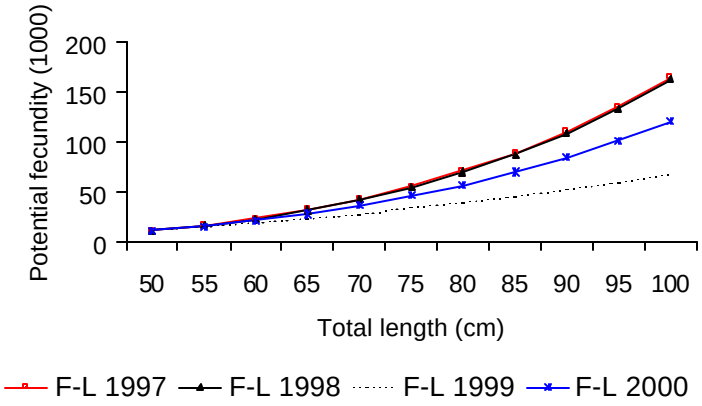

Fig. 1. Fecundity and length relationships estimated for Greenland halibut in East-Greenland waters. Samples were collected during joint Norwegian-Greenlandic surveys (1997, 1998, 2000) and from German factory trawlers (1999).

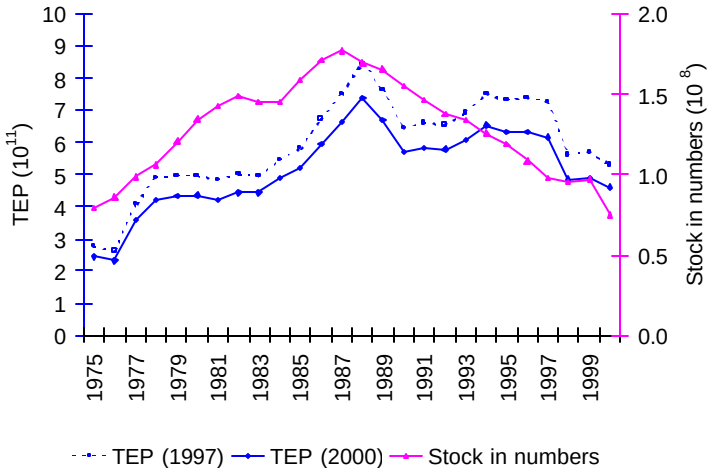

Fig. 2. Total egg production (TEP) estimated from fecundity-length relationships for 1997 (hatched) and 2000 (solid) and spawning stock in numbers for Greenland halibut in the waters of East-Greenland, Iceland and Faroe Islands, (XSA data, ICES Northwestern Working Group, 2000).

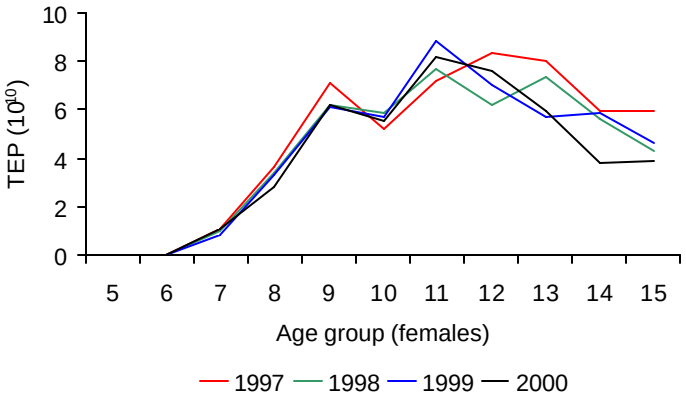

Fig. 3. Total egg production by age for Greenland halibut in East Greenland, Iceland and Faroe Islands, based on XSA data from ICES Northwestern Working Group, 2000. F-L-relationship for 1997 is used.