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Growth and maturity of sprat in Norwegian coastal waters

By

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ABSTRACT

Data on length, age and maturity were analysed to study the growth and spawning of sprat in fjords on the Norwegian West Coast. The data were sampled in 4 fjord Areas in November 1993-1997 (for mean length and weight-at-age) and in the 2nd quarter 1992, 1996-1998, (maturity/ spawning). The samples are taken by pelagic trawling. In addition, the length of 0-group sprat along the western coast was investigated by including sprat sampled further north on the coast. In 0-group sprat, significant differences in mean length were found along the coast. These differences seemed to be stable between years. In fjords just north of 62°N, the length were significant larger and further north significant lower, than in the fjords south of 62°N. Otoliths measured for back-calculation of growth, shows low correlation. In the present study it was shown that sprat stayed in the fjords during the spawning season and that they are spawning. Mature sprat had a minimum length of 8,0-9,0 cm. The results demonstrate that maturation in sprat is length dependent. The length at 50% maturity was 9,3 cm. The present study shows that sprat in the Norwegian fjords normally mature as 1-year olds. They will spawn during the current season but later than older fish (June-July). The spawning frequencies were in the range of 8-20%. Mature/ spawning sprats were found in the entire area and no specific spawning aggregations were observed .

INTRODUCTION

Norwegian fjords are traditionally important sprat fishing Areas. The catches are for the canning industry. The fishery takes place in summer-early autumn with the starting date depending on the length and fat content of the sprat. The sprat in the fjords are young fish, with a dominance of the two youngest year-classes. The fjords on the west coast, south of 62° N, is the main fishing Area. Annual acoustic surveys for 0-group sprat carried out in October-November since 1968, showed that the general distribution pattern is rather similar from year to year (Østvedt 1976, Dommasnes et al., 1994, Torstensen et al., 1995, 1996, 1997, 1998). Approximately the same distribution has been observed in the following spring and summer (Bakken 1971, Torstensen, Unpublished data). The sprat is found distributed in the upper 50 m depth and tends to stay close to the surface in the summer time.

Based on results of egg surveys, it has been assumed that sprat in the fjords mainly recruited from spawning grounds in Skagerrak and/or the North Sea (Sund 1911, Bjerkan 1930, Bakken 1966). In the beginning of the1980s, egg surveys were initiated by fishermen's organisation that questioned the renewal of the populations by immigration of sprat from other Areas. As the fishery mainly exploited young fish, they were concerned about the spawning and recruitment. It was shown that local spawning in the fjords occurred (Torstensen 1984), with a protracted season lasting from February-March till June-July with a peak in May-June. The early spawning indicated that overwintering spawning stock of sprat occurred in the fjords. A protracted spawning season (February-July) in the fjords were confirmed by counting of daily rings in otoliths (Dayaratne 1986)

Despite of the historical importance of the Norwegian sprat fishery, no information on maturation and spawning from examination of sprat in the western fjords, has been published. Sund (1910) and Bjerkan (1930) noted, however, observations of sexually mature sprat. Samples of sprat from commercial trial fishing in the fjords in early 1980s contained spawners. Local sprat spawning was also observed during acoustic survey in early June 1992 (Torstensen and Aglen 1992). The Norwegian Institute of Marine Research has conducted acoustic surveys on sprat in the fjords in the 2nd quarter of 1996-1998, in addition to the surveys in November. The objective of the present study was to analyse available data on length and age related to maturity and spawning of sprat in fjords on the Norwegian west coast.

MATERIAL AND METHODS

The fjords considered in this report are shown in Fig. 1. Sprat samples were collected by a pelagic trawl equipped with a small meshed codend (11 mm stretched). Information of data used in the study of maturity and spawning, are presented in Table 1. The surveys covered the same fjords, except for Area 3, which was not sampled in 1992. The samples considered for growth analyses (length- and weight-at-age) were taken in November 1993-1997. Length, weight, age, sex and maturity stages (not in November) were recorded for individual sprat. Total length was

measured to the nearest 0.5 cm below; weight to nearest g. the maturity stages were assessed based on macroscopic appearance of the gonads on an 8-point scale. For the present presentation, the following stages were considered:

Stage 0 = immature	Gonads small, not possible to distinguish the sexes
Stage 1 = maturing	Ovaries beginning to fill the body cavity, Opaque and translucent oocytes
Stage 2 = mature-running	Dominance of translucent oocytes. Ovaries soft.
Stage 3 = spent	Ovaries empty and flaccid. May contain a few residual eggs.
Stage 4 = recovering	

Females with hydrated oocytes are in an "immediate" spawning state. This stage of maturity is easily identified as the ovaries have a hyaline appearance with large, translucent oocytes. In June 1998 the number of hydrated females was counted and the proportion defined as spawning frequency (Hunter and Macewicz 1980).

Otoliths (*Sagittae*) are used for age determination with January 1 assigned as an arbitrary birth date. The number of winter (hyaline) rings determines the age. For back-calculation of growth from otoliths, the radii of growth zones on the dorsal edge, are measured (x40). Otoliths from November 1997 and June 1998 were considered.

The percentage of otoliths with hyaline and opaque edges, respectively, may be used to indicate the growth season. Otoliths sampled in November 1997 and June 1998 were examined. The edges were recorded according to the following scale, 1: thin hyaline, 2: wide hyaline, 3: thin opaque and 4: wide opaque. A total of 234 (November) and 813 (June) pairs of otoliths were examined.

RESULT AND DISCUSSION

Growth

Mean length-at-age, standard error (S.E) and 95% confidence limits of the means, are presented for each area in Table 2. The samples from each area were taken at the same time each year (November). It was assumed that most of the annual growth had finished by the time of sampling. There were no differences in the mean length of 0-group sprat south of 62°N, but a significant difference between the mean lengths south and north of 62°N. With increasing age, the differences in mean length became greater but sample sizes in the age groups>2 were small. In Area 2, 0-group sprat occurred more frequent than older and represented about 85% of the fish. Due to a low number of older sprat and a scattered occurrences of older age groups in Area 2, the mean length-at-age in an combined Area 1-3 and Area 4, are compared in Fig.3.

Mean weight-at-age by area and year, is given in Table 3. The over-all means per area, demonstrate the same pattern as the length.
In order to do further analyses of variation in length of 0-group sprat along the western coast, a northern area (North) was also included. The mean lengths of 0-group sprat by year and area, are presented in Fig. 5. The diagram indicates that 0-group in the northern area were smaller than sprat of the same year class in the southern fjords. In a nested ANOVA the null hypothese H_0: There are no differences in length of 0-group sprat between years and H_0: There are no differences in length of 0-group sprat between the fjords, were rejected at the 0.01 level. Summary of the nested ANOVA, is presented in the following text table:

Source of variation	SS	DF	MS
Total	15210,55	10877	
Among all years	1959,48	14	
Among fjords	1012,29	2	506,15
Among year within fjords	947,19	4	236,80
Within subgroup (error)	13251,07	10862	1,22

Bjerkan (1930) reported an increase in length of 0-group sprat northwards along the coast. Sprat in the northernmost fjords were assumed to be older due to a longer transport period from the spawning grounds in the Skagerrak/Kattegat. The present results demonstrate significantly larger 0-group sprat in Area 4 than in Area 1-3, but the mean length was lower in the northern Area (North).

Back-calculation from otoliths

The relationship between fish length (cm) and otoliths radius (mm) was studied. Predictive linear regression on all data combined, indicated that only 46% of the variance was explained by a linear regression. The results of the regression analysis for the different areas indicate better correlation in Area 4, but also here the correlation was low (Table 4). The low correlation may be explained by various reasons; i.e. a possible mixing of various populations, the dorsal edge of the otolith is not the proper one for this measurement.

Regression analyses on sprat length (cm) vs otoliths radius (mm) presented by Dayaratne (1986) had the same low level of correlation. In her work the measurements were taken along the longest axis, from the nucleus towards the posterior edge. In the present study measurements were taken on the dorsal edge. This was based on the assumption that the seasonal growth on sprat otoliths are best seen on that edge, an assumption made, however, for Baltic sprat (Anon.undat.). The low correlation coefficient may indicate that this is not the case in the "fjord"sprat or for the period considered. By back-calculation of growth from otoliths it is assumed that the otoliths are from fish in a single population. The shapes of otoliths are caused by

environmental effects and found to change largely in response to differences in growth rate (see Campana and Casselman 1993). As sprat is a young fish, the shape of otoliths will to a high degree reflect annual variations in growth. Wide variations in the shape of the otoliths were observed which might affect the various radii-length relations. Sprat included in the analysis were in the range of 0-4 years with a dominance of fish older than 0-gr.In future study, with more data available, a correlation on the same year class should be analysed.

Otoliths edge

Fig. 4 shows the ratio of the various edge types by age group. In November, most of the otoliths had a thin hyaline edge. In 5% of the otoliths the deposition of summer ring had not terminated. In the 0-group, these represented a larger part than in the older age groups but were based on only 8 specimens. By the end of June, nearly all the otoliths had terminated the winter (hyaline) ring and some had already a wide opaque ring at the edge. Wilson (1979) found that in sprat in Scottish areas, the winter (hyaline) ring was completed in some case in April and in all cases in June Forming of hyaline (winter) and opaque (summer) rings will probably depend on environmental conditions (temperature and food), and thus reflect variations in growth season. There are indications of differences within the same year classes, as demonstrated by the 1994 year- class. The data has not been examined for variations between fjords, as the otoliths examined did not cover all the Areas. In November all the otoliths were taken from Area 1, while the June sample covered sprat from the four areas surveyed. As sprats from Area 1 were the most abundant also in the June sample, the two distributions of edges are considered comparable as indicators for depositions of hyaline Vs opaque rings.

Maturity

The length distributions of sprat in each of the maturity stages immature, maturing and mature/running, are shown in Fig. 6. The distributions indicate that sprat begin to mature at size between 8 and 9 cm and reach the mature/running stage at a length of 8,5-9,5 cm. Larger sprat matured earlier than the smaller one. The mean lengths of immature, maturing and mature/running sprat were significantly different and indicate that maturing in sprat is length dependent (Table 5). Number of mature sprat per length group in 1996-1998, are combined in the maturity oogive presented in Fig. 7. From this, the length at 50% maturity was 9,3 cm.

The maturity at age is presented in Fig. 8. The general trend was the same in each of the fjords (Table 6) and therefore the proportions in age groups are combined for all the fjords. In April 1996 and 1997, 50% or more of each age group were in the maturity stages of maturing or mature-spawners. Age group 5 consists of few fish. In June 1998, all were mature-spawners. The same was indicated by one sample of sprat taken in the commercial trial fishing (early June) in Area 3 in the early 1980ths. The sample consisted of solely 1-group sprat (L_{mean}= 10,6 cm) of which 94% were spawners.

It has been assumed that sprat migrates out of the fjords to spawning grounds (Bjerkan 1930). In the present study it was shown that sprat stayed in the fjords during the spawning season and that they are spawning. Mature/spawning sprats were found in the entire area and no specific spawning aggregations were observed. In April and June, sprat were found in the same areas as in the previous November.

Sprat has a protracted spawning season and spawn in several batches (Heidrich 1925, Alheit 1988). The age at first maturation seems to be largely depend on the length attained in the spring. A lower size at maturity of 8,0-9,0 cm is consistent with the findings of Bailey (1979). The present study shows that sprat in the Norwegian fjords normally mature as 1-year olds. One year old sprat has also been shown to spawn inshore on the west coast of Scotland (De Silva 1973). Bailey (1979) observed 1-group spawners in the north western North Sea but had evidence to assume that they mainly matured as 2 years old. A second spawning season of sprat in the autumn has been detected in the North Sea, with sprat over-wintering as larvae (Alshuth 1988). An over-wintering as larvae with metamorphosis in the second year of life is considered to cause serious problems in age determination. Use of small meshed codend (11 mm stretched length) in the trawl was recommended by the Sprat Biology Workshop in 1986 (Anon. 1990) to ensure a representative sampling of the smallest sprat (3,0-6,0 cm). As no indications of any component of sprats over-wintering as larvae have been observed in the data, the 1-group sprat are considered as having hatched the previous year, i.e. they are 1 year olds. The lengths of 0-group sprat in their first winter (November) are in the range of 3,5-10,0 cm (Torstensen et al. 1995, 1996,1997 and 1998)

The sexual maturation by age group in April 1996 and 1997 shows a relatively great number of sprat in the immature and maturing stages. The data indicates a continuous development of the gonads during the 2nd quarter, which is in accordance with a peak spawning in the end of May-mid June. The maturing sprat observed in April will probably develop further and spawn later in the season.

Few categories of maturity stages are presented as there are no sharp distinctions in sprat gonads between the maturity stages maturing and mature, or between immature and recovering/spent. The numbers of oocytes per spawning vary considerably during the season (Alheit 1988). As the spawning progress and portions of oocytes are shed, there is still a continuing mixture of oocytes in various developing stages (Torstensen 1992) at the same time as the volume of the gonads decrease. In the present data few specimens are defined as stage 4.

Spawning frequency

In June 1998, the number of females with hydrated oocytes was recorded. This determination was done macroscopically and the percentage of hydrated females per Area, was:

Area 1: 20,2 % (188)
Area 2: 17,0 % (94)
Area 3: 16,0 % (268)
Area 4: 8,3% (36)
Over all: 17,7 %

The number of females examined, is given in parentheses. The distributions of age and length structures in the two categories of females, those with and without hydrated oocytes (Fig.9) indicate no significant differences between the two categories. The samples with hydrated females were taken both day and night.

The observed spawning frequencies, 8-20%, indicate a reduction from south to north. This may very well be the case, but seems more to be explained by the low number of females sampled in Area 4. Assuming an over all spawning frequency of approximately 18 % imply an interval of 5,6 days between the batches or that 18% of the females were spawning every day.

The spawning frequencies (8-20%) are in the same range as has been reported previously (see Alheit 1989). The method to count females with hydrated oocytes has been considered to give an overestimation of "hydrated " females due to behavioural changes during spawning. (Alheit, 1989, Alheit *et al.*,1984, Hunter and Macewicz, 1985). The samples taken in June 1998 are from the peak spawning period. As the sprat were distributed within the same Areas as observed in the previous November (inner-middle fjord Areas), immigration and emigration during the spawning is assumed to be negligible. No indications of spawning aggregations or behavioural changes are observed in the fjord. The observed distribution of sprat close to the surface, may be related to spawning but as the trawling were performed in the surface layer, the method is supposed to give a proper estimate of the spawning frequency in the fjords.

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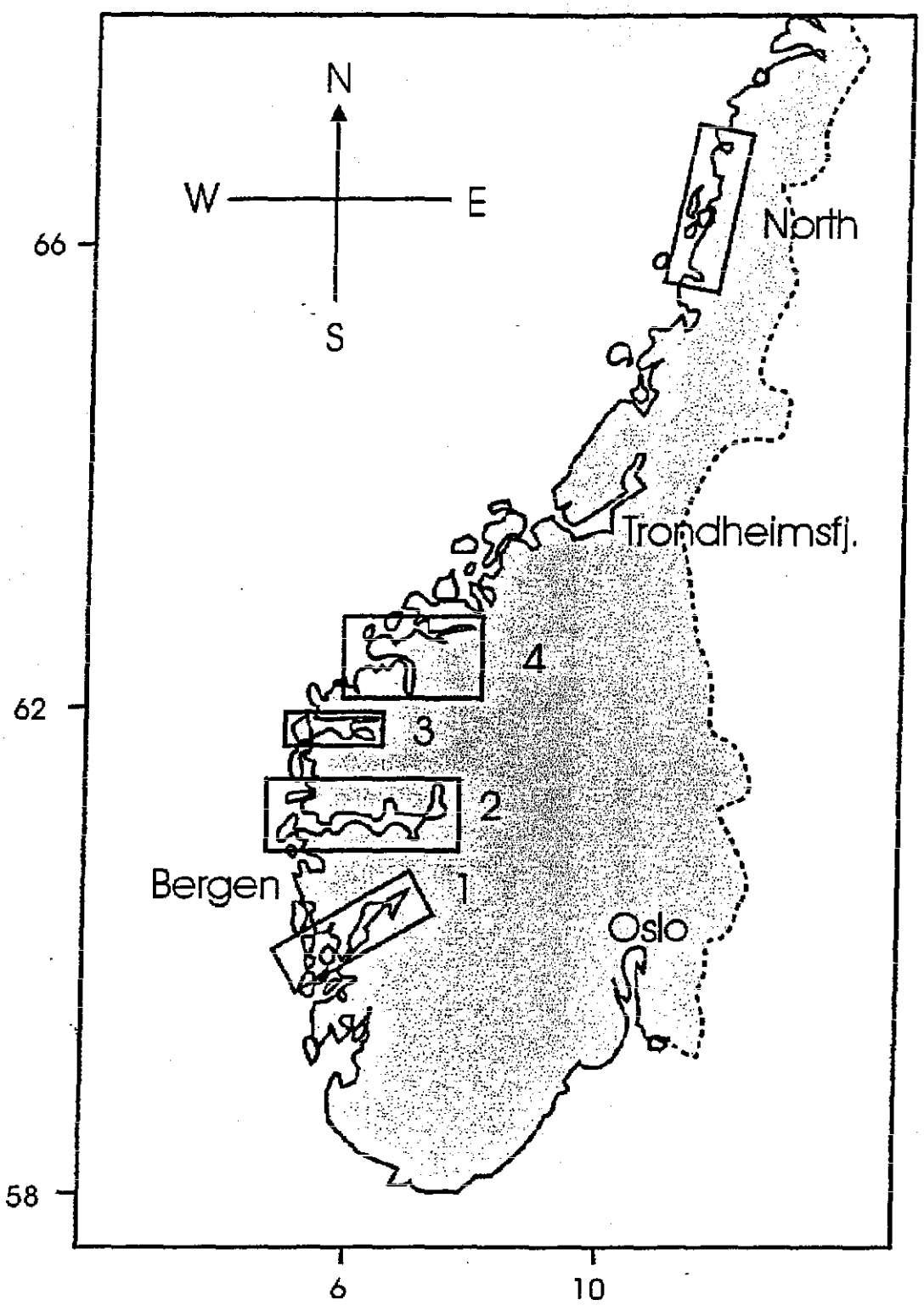


Fig. 1. Location of the surveyed fjord areas

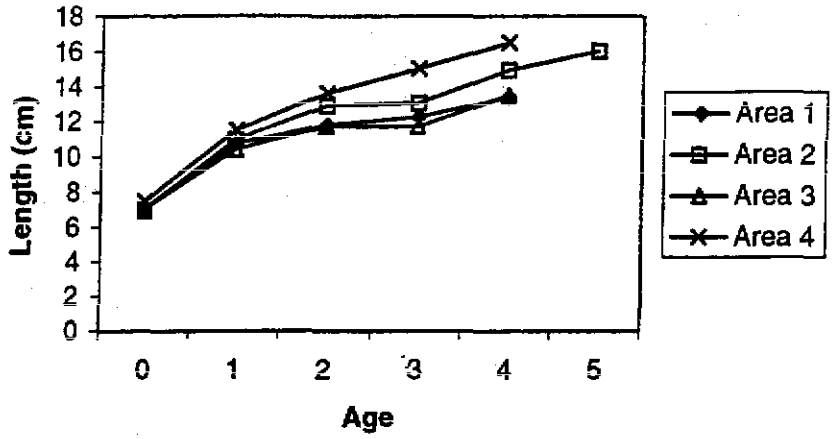


Fig. 2. Mean length-at age of sprat by area in November, 1993-1997.

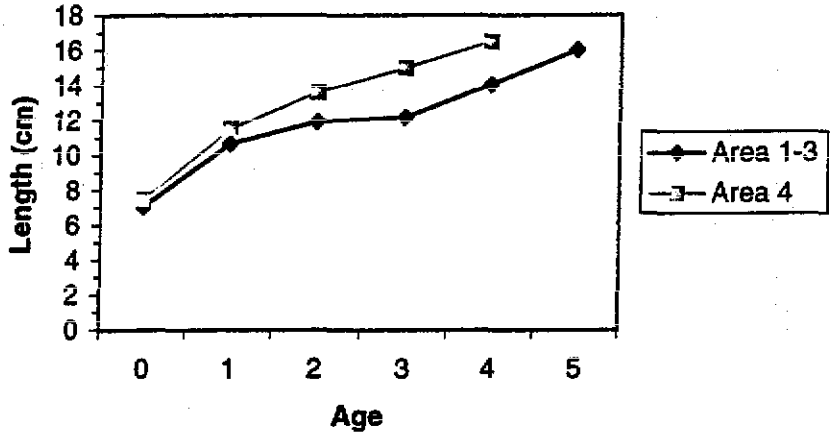
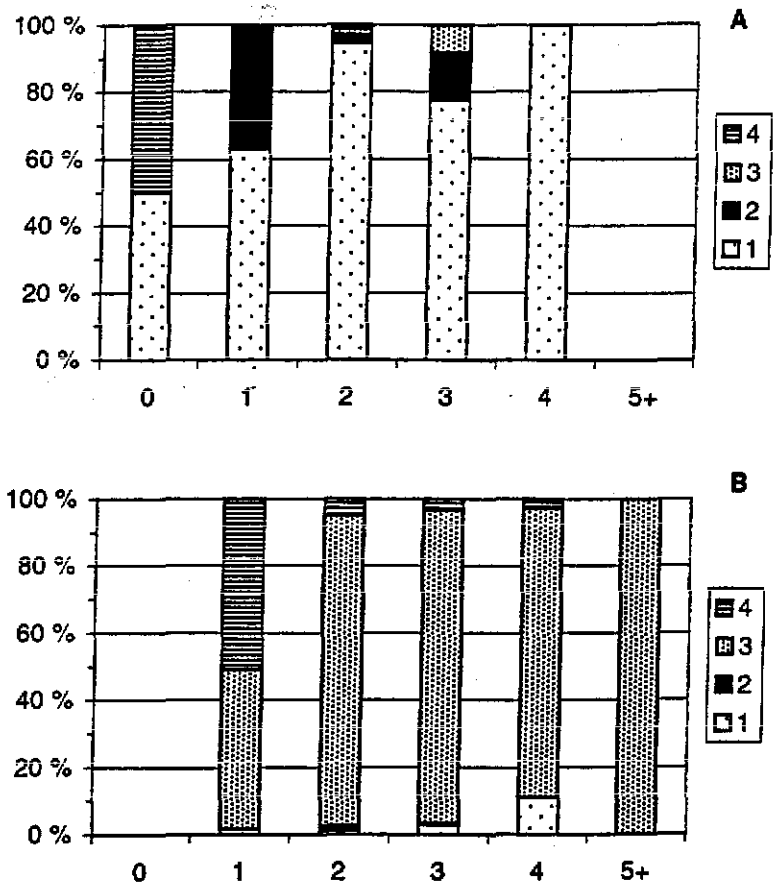


Fig. 3. Mean length-at-age south (Area 1-3) and north (Area-4) of 62N. November 1993-1997.



Edge 1: Thin hyaline, 2: Wide hyaline, 3: Thin opaque, 4: Wide opaque

Fig.4. Percentage of hyaline and opaque edges on sprat otoliths by age in November 1997(A) and June 1998 (B).

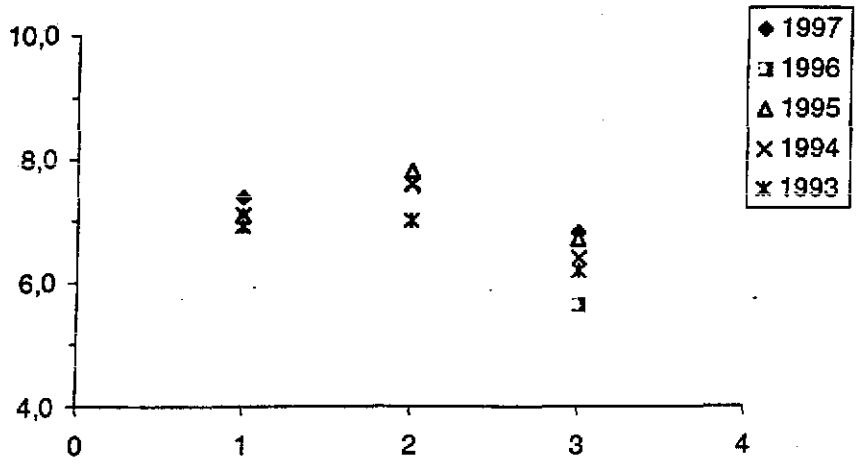


Fig. 5. Mean lengths of 0-group sprat by year and area. 1: Combined fjords1-3, 2: Fjord area 4, 3: North

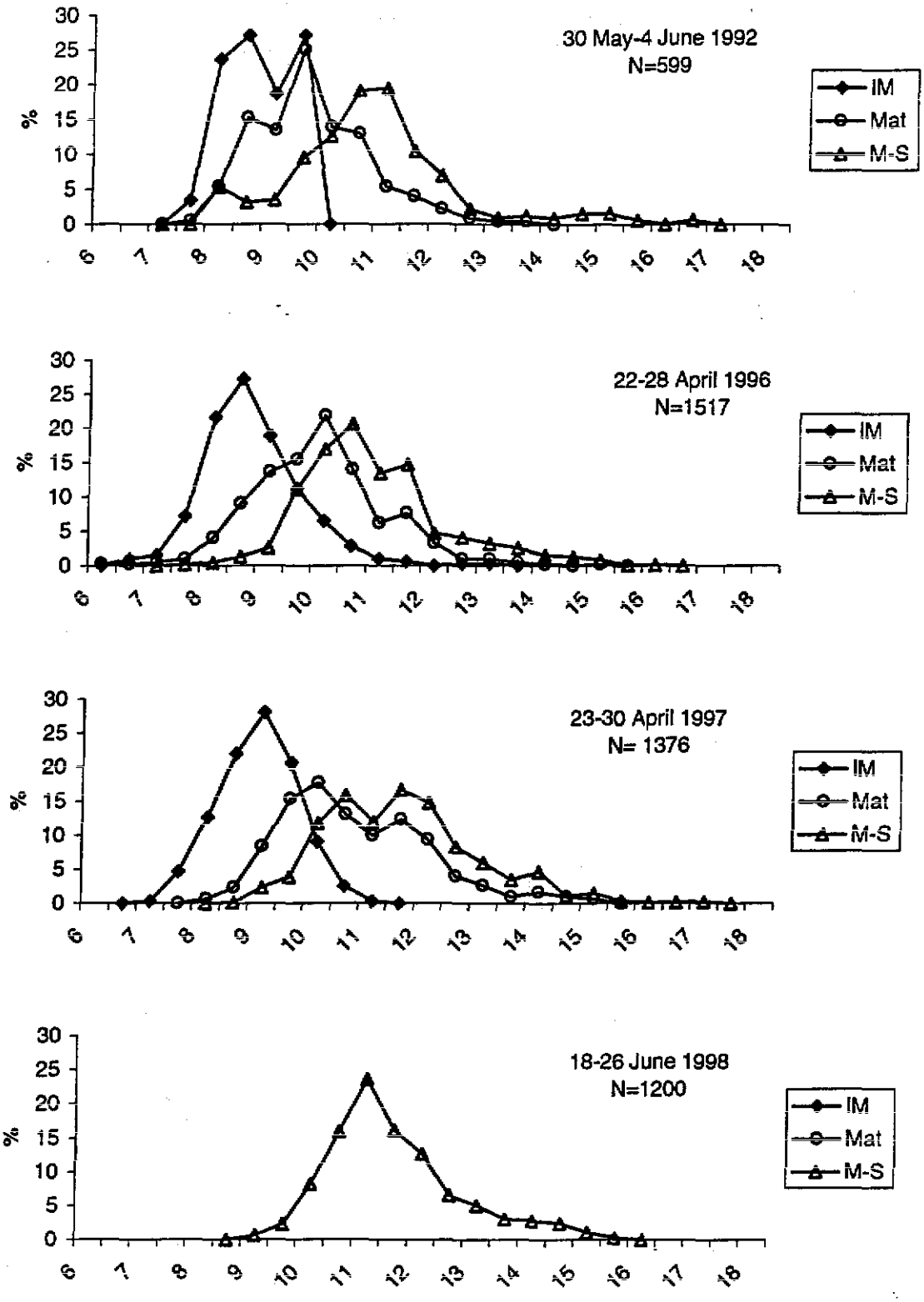


Fig.6. Length distribution (%) of maturity stages of sprat in the 2nd quarter, 1992 and 1996-1998. IM: immature, Mat.: maturing, M-S: mature-spawner

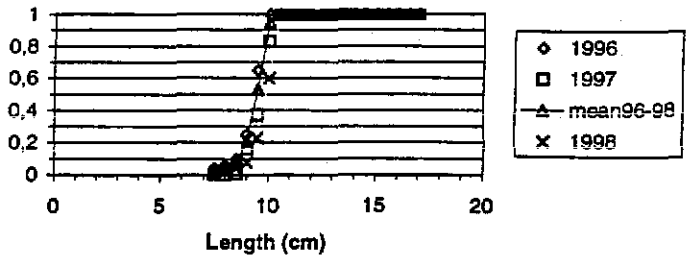


Fig. 7. The relative number of mature/spawning female per length group.

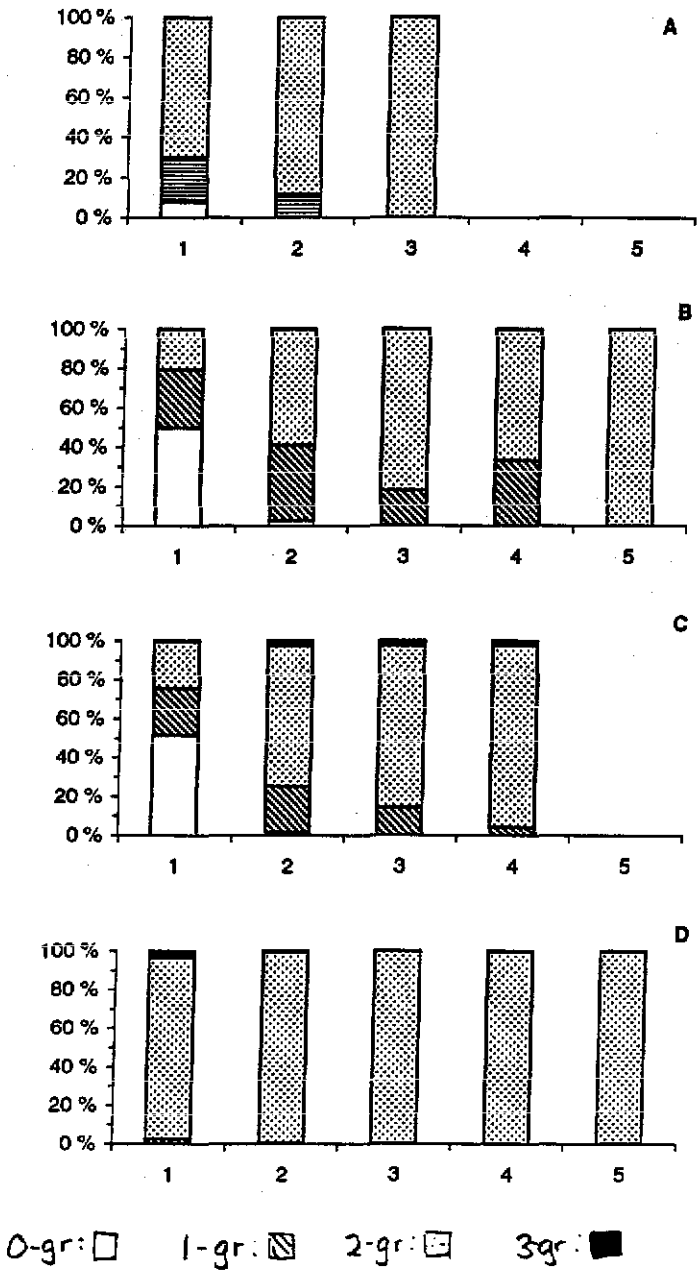


Fig. 8. Maturity at age of sprat in Norwegian fjords.A) 30 May-4 June 1992, B) 22-28 April 1996,C) 23-30 April 1997 and D) 18-26 June 1998

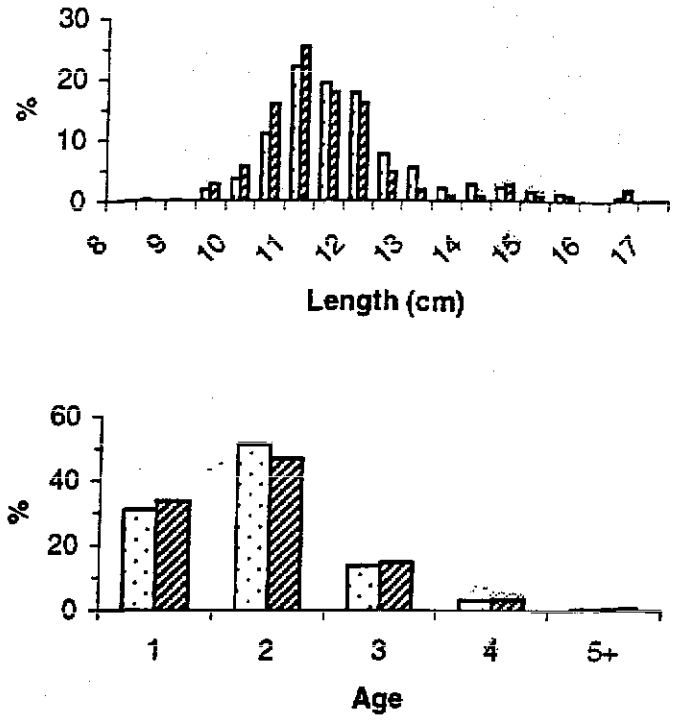


Fig. 9. Length and age distribution of females with (1) and without (2) hydrated oocytes.

Table 1. Samples of sprat from Area 1-4, 1993-1998. Number of sprat length measured (L), weighted (W) and aged (A)

Year	Date	Number of sprat		
		L	W	A
1993	November	1989	723	1849
1994	November	2244	1489	1205
1995	November	3383	1633	2845
1996	November	2268	972	1845
1997	November	2288	1303	1558

Year	Date	Number of sprat		
		L	W	A
1992	30 May-4 June	599	599	494
1996	22-28 April	1517	1517	1162
1997	23-30 April	2652	2509	1817
1998	18-26 June	2007	1869	1137

Table 2. Mean length (cm) at age, standard error (s.e) and confidence limits (C.I.) of means.

Area 1

Year	Age (yr)					
class	0	1	2	3	4	5
1990						
1991			11,0			
1992		11,1	11,3		16,0	
1993	6,8	10,3	11,7	12,3	13,2	
1994	7,3	11,5	11,8	12,1		
1995	7,2	11,7	12,0			
1996	7,0	10,7				
1997	7,0					
Mean	7,11	10,72	11,79	12,23	13,37	
s.e	0,02	0,06	0,06	0,12	0,35	
C.I.	7,07-7,15	10,6-10,84	11,67-11,91	11,99-12,47	12,62-14,12	

Area 2

Year	Age (yr)					
class	0	1	2	3	4	5
1990				13,5		
1991			12,2			
1992		11,5				16,0
1993	6,8	10,6			14,9	
1994	8,3			13,0		
1995	6,0					
1996	6,7	11,0				
1997	7,4					
Mean	7,02	10,96	12,88	13,05	14,93	16,00
s.e	0,04	0,10	0,13	0,26	0,33	
C.I.	6,94-7,10	10,76-11,16	12,62-13,04	12,52-13,58	14,22-15,64	

Area 3

Year	Age (yr)					
class	0	1	2	3	4	5
1990						
1991						
1992		9,8	11,3	12,7	14,0	
1993	6,7	11,8	12,3	12,4	13,0	
1994	7,5	10,4	11,8	11,4		
1995	7,4	10,5	10,8			
1996	6,8	10,4				
1997						
Mean	7,10	10,40	11,70	11,70	13,50	
s.e	0,07	0,05	0,09	0,11	0,35	
C.I.	6,96-7,24	10,3-10,5	11,52-11,98	11,48-11,81	11,92-15,08	

Area 4

Year	Age (yr)					
class	0	1	2	3	4	5
1990				16,5	16,5	
1991			14,6	14,7		
1992		13,5	13,9	14,8		
1993	6,9	11,4	13,5	14,9		
1994	7,2	11,7	13,6			
1995	7,7	11,6	12,5			
1996	7,5	11,6				
1997	7,6					
Mean	7,50	11,50	13,60	15,00	16,50	
s.e	0,02	0,04	0,07	0,17		
C.I.	7,46-7,54	11,42-11,58	13,46-13,74	14,66-15,34		

Table 3. Mean length (cm) at age, standard error (s.e) and confidence limits (C.I.) of means.

Area 1	Age					
	0	1	2	3	4	5
1990						
1991			9,5			
1992		9,7	9,3		29,0	
1993	3,3	7,7	11,7	13,1	14,6	
1994	2,7	11,2	11,7	10,8		
1995	3,5	11,4	10,8			
1996	2,4	7,9				
1997	3,0					
Mean	3,00	8,60	11,40	11,70	15,60	
s.e	0,04	0,14	0,19	0,40	1,49	
C.I.	2,92-3,08	8,33-8,87	11,03-11,77	10,92-12,48	12,4-18,8	

Area 2	Age					
	0	1	2	3	4	5
1990				18,5		
1991			13,0			
1992		10,5				27,0
1993	3,3	8,9			22,5	
1994	4,0			14,4		
1995	4,2	9,5	16,0			
1996	3,6	9,8				
1997						
Mean	3,60	9,60	14,80	14,90	22,50	27,00
s.e	0,05	0,27	0,45	1,00	1,40	
C.I	3,50-3,7	9,06-10,14	13,9-15,7	12,85-16,95	19,48-25,52	

Area 3						
Year	Age					
class	0	1	2	3	4	5
1990						
1991						
1992		6,5	10,7	13,2	19	
1993	4	11,7	12,3	11,4	14	
1994	2,7	7,9	11	9,8		
1995	2,6	7,8	8,6			
1996	2,3	8,4				
1997	4					
Mean	3,10	7,80	10,80	10,40	16,50	
s.e	0,07	0,12	0,26	0,28		
C.I	2,96-3,24	7,56-8,04	10,29-11,31	9,84-10,96	11,22-21,78	

Area 4						
Year	Age					
class	0	1	2	3	4	5
1990				30,4	34,0	
1991			22,0	21,6		
1992		17,8	18,0	23,5		
1993	2,3	9,9	17,2	23,4		
1994	2,7	11,2	17,6	24,0		
1995	3,8	10,6	12,6			
1996	3,5	10,1				
1997	3,9					
Mean	3,20	10,30	17,60	23,90	34,00	
s.e	0,05	0,12	0,31	0,90		
C.I	3,1-3,3	10,06-10,54	16,99-18,21	22,09-25,71		

Table 4. Regression fish total length (cm) vs otolith radii (mm) by area.

	slope	intercept	r2	N	Length (cm)
Area 1	15,96	1,87	0,41	350	8,0-15,5
Area 2	5,88	7,73	0,14	17	10,0-12,0
Area 3	7,29	6,89	0,2	60	10,0-12,5
Area 4	17,07	1,62	0,66	84	8,0-14,0
Overall	14,68	2,66	0,46	512	

Table 5. Mean length, confidence interval (C.I.) and number of sprat in maturity stage immature, maturing and mature-spawner.

Year	Immature				Maturing				Mature-Running			
	Lmean	s.e.	C.I	N	Lmean	s.e.	C.I	N	Lmean	s.e.	C.I	N
1992	8,7	0,079	8,5-8,9	59	9,7	0,070	9,6-9,8	223	10,7	0,084	10,5-10,9	317
1996	8,7	0,050	8,6-8,9	323	9,9	0,058	9,8-10,0	421	10,9	0,046	10,8-11,0	773
1997	8,9	0,043	8,8-9,0	278	10,7	0,077	10,5-10,9	300	11,5	0,049	11,4-11,6	775
1998					9,8	0,211	9,4-10,2	6	11,5	0,032	11,4-11,6	1499

Table 6. SPRAT. Proportion of maturity stages per age group per fjord area.

1992

Area/Maturity	Age-group				
FJORD 1	1	2	3	4	5
0	0,00	0,00	0,00		
1	0,29	0,12	0,00		
2	0,71	0,88	1,00		
3					
4					
Total	109	16	15		
FJORD 2					
0					
1					
2					
3					
4					
Total					
FJORD 3					
0	0,27				
1	0,40				
2	0,33				
3					
4					
Total	96				
FJORD 4					
0	0,03				
1	0,12				
2	0,85	1,00	1,00		
3					
4					
Total	238	1	2		
Grand total	443	17	17	0	0

1996

Area/Maturity	Age-group				
FJORD 1	1	2	3	4	5
0	0,64	0,03	0,02		
1	0,27	0,52	0,16		
2	0,09	0,45	0,83	1,00	
3					
4					
Total	231	33	161	1	
FJORD 2					
0	0,20				
1	0,44	0,34	0,11		
2	0,36	0,66	0,89	1,00	
3					
4					
Total	85	35	36	1	
FJORD 3					
0	0,70	0,04	0,11	0,09	
1	0,22	0,44	0,56	0,27	
2	0,08	0,52	0,33	0,64	
3					
4					
Total	119	163	9	11	
FJORD 4					
0	0,32	0,01		0,09	
1	0,31	0,20	0,16	0,27	
2	0,37	0,78	0,84	0,64	1,00
3					
4					
Total	170	69	37	11	1
Grand total	605	300	243	24	1

1997

Area/Maturity	Age-group				
FJORD 1	1	2	3	4	5
0	0,75	0,02			
1	0,23	0,29	0,20	0,05	
2	0,03	0,66	0,77	0,93	
3		0,01	0,01		
4		0,03	0,02	0,03	
Total	270	294	97	40	
FJORD 2					
0	0,16				
1	0,27	0,13	0,02		
2	0,56	0,87	0,98		
3	0,01				
4	0,01				
Total	163	126	51		
FJORD 3					
0	0,88	0,03			
1	0,12	0,22	0,15		
2		0,70	0,80		
3		0,01			
4		0,03	0,05		
Total	33	147	20		
FJORD 4					
0	0,21				
1	0,30	0,22	0,19		
2	0,48	0,78	0,78	1,00	
3			0,04		
4					
Total	56	36	27	5	
Grand total	522	603	195	45	

1998

Area/Maturity	Age-group				
FJORD 1	1	2	3	4	5
0					
1	0,13	0,01			
2	0,83	0,99	1,00	1,00	1,00
3	0,04				
4					
Total	24	308	93	21	2
FJORD 2					
0					
1					
2	1,00	1,00	1,00	1,00	1,00
3					
4					
Total	29	248	56	15	2
FJORD 3					
0					
1					
2	1,00	0,99	1,00	1,00	1,00
3		0,01			
4					
Total	23	82	60	23	2
FJORD 4					
0					
1					
2	0,93	1,00	1,00		
3	0,07				
4					
Total	42	7	1		
Grand total	118	645	210	59	6