

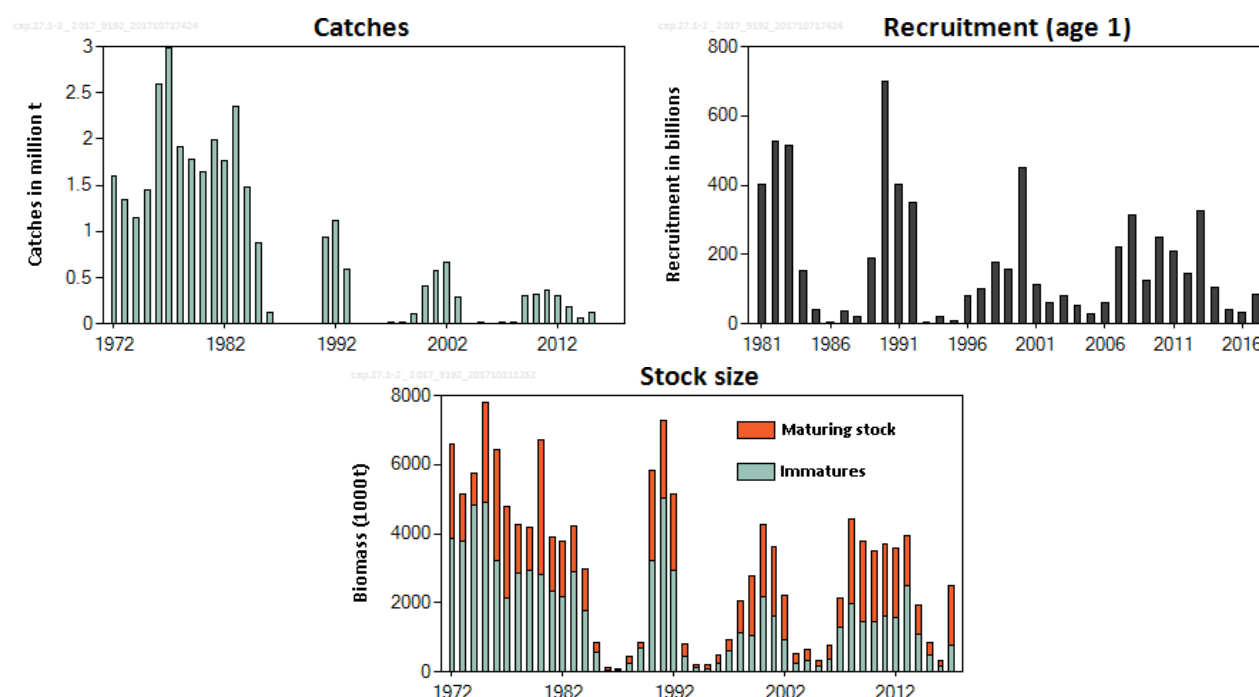
## Capelin (*Mallotus villosus*) in subareas 1 and 2 (Northeast Arctic), excluding Division 2.a west of 5°W (Barents Sea capelin)

### ICES stock advice

ICES advises that when the management plan of the Joint Norwegian–Russian Fisheries Commission (JNRFC) is applied, catches in 2018 should be no more than 205 000 tonnes.

### Stock development over time

The maturing component of the stock in autumn 2017 was estimated by the acoustic survey to be much larger than estimated in 2016. The estimate of the 2016 year class at age 1, using the results of the survey conducted in September 2017, is below the long-term average although higher than the 2014 and 2015 year classes. (See also “Quality of the assessment”.)



**Figure 1** Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W. Summary of the stock assessment. Catch in millions of tonnes, stock biomass in thousands of tonnes, and recruitment abundance in billions of fish. Both the total, the maturing stock, and the recruitment are estimates obtained from the acoustic survey in September; therefore, the maturing biomass does not compare directly to the reference point ( $B_{lim}$ ), which relates to SSB in April. However, with a fishery of no more than 205 000 tonnes the probability that the stock will be less than  $B_{lim}$  in April 2018 is  $\leq 5\%$ . The recruitment plot is shown only from 1980 onwards, since earlier estimates of age 1 capelin are based on incomplete survey area coverage.

### Stock and exploitation status

**Table 1** Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W. State of the stock and fishery relative to reference points.

|                           |                   | Fishing pressure |      |      | Stock size |                   |      |   |   |           |
|---------------------------|-------------------|------------------|------|------|------------|-------------------|------|---|---|-----------|
|                           |                   | 2015             | 2016 | 2017 | 2016       | 2017              | 2018 |   |   |           |
| Maximum Sustainable Yield | $F_{MSY}$         | ?                | ?    | ?    | Undefined  | $MSY B_{Trigger}$ | ?    | ? | ? | Undefined |
| Precautionary Approach    | $F_{pa}, F_{lim}$ | ?                | ?    | ?    | Undefined  | $B_{lim}$         | ✘    | ✘ | ✔ | Above     |
| Management plan           | $F_{MGT}$         | ?                | ?    | ?    | Undefined  | $B_{MGT}$         | ?    | ? | ? | Undefined |

**Catch options**

**Table 2** Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W. The basis for the catch options. Weights are in tonnes.

| Variable                                                                           | Value     | Source      | Notes                                                                                                                                          |
|------------------------------------------------------------------------------------|-----------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Maturing stock biomass 2017                                                        | 1723000 t | ICES (2017) | Stock estimate based on the autumn acoustic survey 1 October 2017.                                                                             |
| Predation in tonnes by immature cod in January–March 2018 from the predation model | 597000 t  | ICES (2017) | Prediction of cod abundance in 2018 (ICES, 2017) from the 2017 cod stock assessment. The predation model is based on cod stomach content data. |

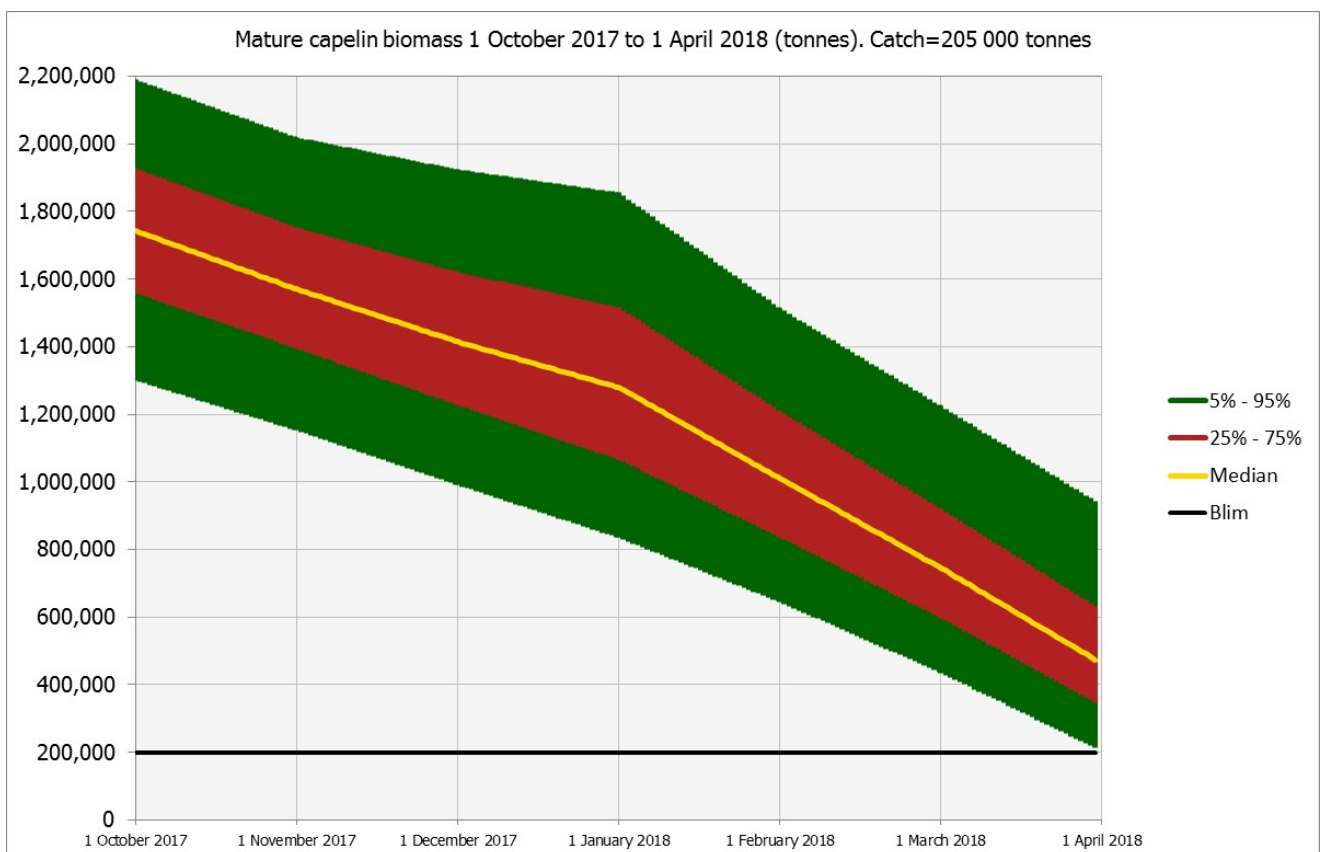
**Table 3** Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W. Annual catch options. All weights are in tonnes.

| Basis                                             | Total catch (2018) | F <sub>total</sub> (2018) | SSB (2018) | P (SSB 2018 > 200000 t) | % TAC change * |
|---------------------------------------------------|--------------------|---------------------------|------------|-------------------------|----------------|
| ICES advice basis                                 |                    |                           |            |                         |                |
| MP Harvest Control Rule, P (SSB > 200000 t) = 95% | 205000             | NA                        | 462000     | 95%                     | NA             |
| Other options                                     |                    |                           |            |                         |                |
| F = 0                                             | 0                  | NA                        | 636000     | 100%                    | NA             |

\* TAC (2018) vs. TAC (2017). As TAC (2017) is zero, the percentage change cannot be calculated.

NA = not available.

Calculations of catch options are based on a forward projection from the autumn acoustic survey, taking predation by immature cod, other natural mortality, and fishery options into account to calculate an SSB estimate for April 2018.



**Figure 2** Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W. Probabilistic prognosis 1 October 2017–1 April 2018 for the Barents Sea capelin maturing stock, with TAC = 205 000 tonnes. Biomass in tonnes. The median and the 5th, 25th, 75th, and 95th percentiles of the distribution are shown.

## Basis of the advice

**Table 4** Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W. The basis of the advice.

|                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Advice basis    | Management plan.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Management plan | At the 31st meeting of the Joint Norwegian–Russian Fisheries Commission (JNRFC) in November 2002, the following management plan was adopted: “For capelin, the following harvest control rule should be used: The TAC for the following year should be set so that, with 95% probability, at least 200 000 tonnes of capelin (Blim) will be allowed to spawn.” At the 39th Session of the Joint Norwegian–Russian Fisheries Commission in October 2010 it was agreed that this management plan should be used “for five more years” before it is evaluated. In 2015 JNRFC suggested three alternative HCRs for this stock; setting P(SSB < 200 000 t) to 90%, 85%, and 80%, respectively. These options were evaluated by ICES in 2016 (ICES, 2016a), and only the existing HCR was found to be precautionary. Thus, the harvest control rule was not changed at the 46th Session of the Joint Norwegian–Russian Fisheries Commission in 2016 (JNRFC, 2016). It was, however, decided that the harvest control rule should be evaluated again in 2021. |

## Quality of the assessment

The assessment is based on an annual acoustic survey. The survey coverage in 2017 was good and is considered to include almost the entire distribution of the stock. The survey estimate in 2017 was much higher than what was expected on the basis of the 2016 survey. This either indicates that the 2016 survey provided an underestimate of the stock or that the 2017 survey provides an overestimate. Based on the available information about survey design and coverage, interpretation of acoustic recordings, cohort development, and estimated capelin consumption by cod, ICES considers it more likely that the 2016 estimate was an underestimate rather than the 2017 estimate being an overestimate.

## Issues relevant for the advice

There is no information.

## Reference points

**Table 5** Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W. Reference points, values, and their technical basis.

| Framework              | Reference point   | Value     | Technical basis                                                          | Source      |
|------------------------|-------------------|-----------|--------------------------------------------------------------------------|-------------|
| MSY approach           | MSY $B_{trigger}$ |           |                                                                          |             |
|                        | $F_{MSY}$         |           |                                                                          |             |
| Precautionary approach | $B_{lim}$         | 200 000 t | Above $SSB_{1989}$ , the lowest SSB that has produced a good year class. | ICES (2001) |
|                        | $B_{pa}$          |           |                                                                          |             |
|                        | $F_{lim}$         |           |                                                                          |             |
|                        | $F_{pa}$          |           |                                                                          |             |
| Management plan        | $SSB_{mgt}$       |           |                                                                          |             |
|                        | $F_{mgt}$         |           |                                                                          |             |

## Basis of the assessment

**Table 6** Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W. Basis of the assessment and advice.

|                          |                                                                                                                                                                                                                                                                       |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ICES stock data category | 1 (ICES, 2016b).                                                                                                                                                                                                                                                      |
| Assessment type          | Model based on acoustic survey and prediction six months ahead to calculate spawning biomass. The model estimates maturity, growth, and mortality (including predation by immature cod on pre-spawning capelin). Target escapement strategy used.                     |
| Input data               | Norwegian–Russian acoustic survey in September (Eco-NoRu-Q3 (Aco)). • Model estimates of maturation based on survey data. • Natural mortalities from multispecies model (predation by immature cod on pre-spawning capelin) and based on historical survey estimates. |
| Discards and bycatch     | All catches are assumed to be landed. The amount of bycaught capelin in other fisheries is very low.                                                                                                                                                                  |
| Indicators               | None.                                                                                                                                                                                                                                                                 |
| Other information        | Latest benchmark was in 2015 (ICES, 2015).                                                                                                                                                                                                                            |
| Working group            | Arctic Fisheries Working Group (AFWG)                                                                                                                                                                                                                                 |

### Information from stakeholders

No information provided.

### History of the advice, catch, and management

**Table 7** Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W. ICES advice and official landings. All weights are in tonnes.

| Year | ICES advice                            | Recommended TAC | Agreed TAC | ICES catch |
|------|----------------------------------------|-----------------|------------|------------|
| 1987 | Catches at lowest practical level      | 0               | 0          | 0          |
| 1988 | No catch                               | 0               | 0          | 0          |
| 1989 | No catch                               | 0               | 0          | 0          |
| 1990 | No catch                               | 0               | 0          | 0          |
| 1991 | TAC                                    | 1000000         | 900000     | 933000     |
| 1992 | SSB > 4–500 000 t                      | 834000          | 1100000    | 1123000    |
| 1993 | A cautious approach, SSB > 4–500 000 t | 600000          | 630000     | 586000     |
| 1994 | No fishing                             | 0               | 0          | 0          |
| 1995 | No fishing                             | 0               | 0          | 0          |
| 1996 | No fishing                             | 0               | 0          | 0          |
| 1997 | No fishing                             | 0               | 0          | 1000       |
| 1998 | No fishing                             | 0               | 0          | 3000       |
| 1999 | SSB > 500 000 t                        | 79000           | 80000      | 101000     |
| 2000 | 5% probability of SSB < 200 000 t      | 435000          | 435000     | 414000     |
| 2001 | 5% probability of SSB < 200 000 t      | 630000          | 630000     | 568000     |
| 2002 | 5% probability of SSB < 200 000 t      | 650000          | 650000     | 651000     |
| 2003 | 5% probability of SSB < 200 000 t      | 310000          | 310000     | 282000     |
| 2004 | No fishing                             | 0               | 0          | 0          |
| 2005 | No fishing                             | 0               | 0          | 1000*      |
| 2006 | No fishing                             | 0               | 0          | 0          |
| 2007 | No fishing                             | 0               | 0          | 4000*      |
| 2008 | No fishing                             | 0               | 0          | 12000*     |
| 2009 | 5% probability of SSB < 200 000 t      | 390000          | 390000     | 307000     |
| 2010 | 5% probability of SSB < 200 000 t      | 360000          | 360000     | 323000     |
| 2011 | 5% probability of SSB < 200 000 t      | 380000          | 380000     | 360000     |
| 2012 | 5% probability of SSB < 200 000 t      | 320000          | 320000     | 296000     |
| 2013 | 5% probability of SSB < 200 000 t      | 200000          | 200000     | 177000     |
| 2014 | 5% probability of SSB < 200 000 t      | 65000           | 65000      | 66000      |
| 2015 | 5% probability of SSB < 200 000 t      | 6000            | 120000     | 115000     |
| 2016 | Zero catch                             | 0               | 0          | 0          |
| 2017 | Zero catch                             | 0               | 0          | 0          |
| 2018 | 5% probability of SSB < 200 000 t      | 205000          |            |            |

\*Research catch.

### History of the catch and landings

**Table 8** Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W. Catch distribution by fleet in 2017 as estimated by ICES.

| Catch (2017) | Landings | Discards |
|--------------|----------|----------|
| 0 tonnes     | 0 tonnes | 0 tonnes |

**Table 9** Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W. History of official catches is presented for each country participating in the fishery. All weights are in tonnes.

| Year | Winter  |        |        | Summer–autumn |        |        | Year total |         |
|------|---------|--------|--------|---------------|--------|--------|------------|---------|
|      | Norway  | Russia | Others | Total         | Norway | Russia |            | Total   |
| 1965 | 217000  | 7000   | 0      | 224000        | 0      | 0      | 0          | 224000  |
| 1966 | 380000  | 9000   | 0      | 389000        | 0      | 0      | 0          | 389000  |
| 1967 | 403000  | 6000   | 0      | 409000        | 0      | 0      | 0          | 409000  |
| 1968 | 460000  | 15000  | 0      | 475000        | 62000  | 0      | 62000      | 537000  |
| 1969 | 436000  | 1000   | 0      | 437000        | 243000 | 0      | 243000     | 680000  |
| 1970 | 955000  | 8000   | 0      | 963000        | 346000 | 5000   | 351000     | 1314000 |
| 1971 | 1300000 | 14000  | 0      | 1314000       | 71000  | 7000   | 78000      | 1392000 |
| 1972 | 1208000 | 24000  | 0      | 1232000       | 347000 | 13000  | 360000     | 1591000 |
| 1973 | 1078000 | 34000  | 0      | 1112000       | 213000 | 12000  | 225000     | 1337000 |
| 1974 | 749000  | 63000  | 0      | 812000        | 237000 | 99000  | 336000     | 1148000 |
| 1975 | 559000  | 301000 | 43000  | 903000        | 407000 | 131000 | 538000     | 1441000 |
| 1976 | 1252000 | 228000 | 0      | 1480000       | 739000 | 368000 | 1107000    | 2587000 |
| 1977 | 1441000 | 317000 | 2000   | 1760000       | 722000 | 504000 | 1226000    | 2986000 |
| 1978 | 784000  | 429000 | 25000  | 1238000       | 360000 | 318000 | 678000     | 1916000 |
| 1979 | 539000  | 342000 | 5000   | 886000        | 570000 | 326000 | 896000     | 1782000 |
| 1980 | 539000  | 253000 | 9000   | 801000        | 459000 | 388000 | 847000     | 1648000 |
| 1981 | 784000  | 429000 | 28000  | 1241000       | 454000 | 292000 | 746000     | 1986000 |
| 1982 | 568000  | 260000 | 5000   | 833000        | 591000 | 336000 | 927000     | 1760000 |
| 1983 | 751000  | 373000 | 36000  | 1160000       | 758000 | 439000 | 1197000    | 2357000 |
| 1984 | 330000  | 257000 | 42000  | 629000        | 481000 | 368000 | 849000     | 1477000 |
| 1985 | 340000  | 234000 | 17000  | 591000        | 113000 | 164000 | 277000     | 868000  |
| 1986 | 72000   | 51000  | 0      | 123000        | 0      | 0      | 0          | 123000  |
| 1987 | 0       | 0      | 0      | 0             | 0      | 0      | 0          | 0       |
| 1988 | 0       | 0      | 0      | 0             | 0      | 0      | 0          | 0       |
| 1989 | 0       | 0      | 0      | 0             | 0      | 0      | 0          | 0       |
| 1990 | 0       | 0      | 0      | 0             | 0      | 0      | 0          | 0       |
| 1991 | 528000  | 159000 | 20000  | 707000        | 31000  | 195000 | 226000     | 933000  |
| 1992 | 620000  | 247000 | 24000  | 891000        | 73000  | 159000 | 232000     | 1123000 |
| 1993 | 402000  | 170000 | 14000  | 586000        | 0      | 0      | 0          | 586000  |
| 1994 | 0       | 0      | 0      | 0             | 0      | 0      | 0          | 0       |
| 1995 | 0       | 0      | 0      | 0             | 0      | 0      | 0          | 0       |
| 1996 | 0       | 0      | 0      | 0             | 0      | 0      | 0          | 0       |
| 1997 | 0       | 0      | 0      | 0             | 0      | 1000   | 1000       | 1000    |
| 1998 | 0       | 2000   | 0      | 2000          | 0      | 1000   | 1000       | 3000    |
| 1999 | 50000   | 33000  | 0      | 83000         | 0      | 22000  | 22000      | 105000  |
| 2000 | 279000  | 94000  | 8000   | 381000        | 0      | 29000  | 29000      | 410000  |
| 2001 | 376000  | 180000 | 8000   | 564000        | 0      | 14000  | 14000      | 578000  |
| 2002 | 398000  | 228000 | 17000  | 643000        | 0      | 16000  | 16000      | 659000  |
| 2003 | 180000  | 93000  | 9000   | 282000        | 0      | 0      | 0          | 282000  |
| 2004 | 0       | 0      | 0      | 0             | 0      | 0      | 0          | 0       |
| 2005 | 1000    | 0      | 0      | 1000          | 0      | 0      | 0          | 1000    |
| 2006 | 0       | 0      | 0      | 0             | 0      | 0      | 0          | 0       |
| 2007 | 2000    | 2000   | 0      | 4000          | 0      | 0      | 0          | 4000    |
| 2008 | 5000    | 5000   | 0      | 10000         | 0      | 2000   | 2000       | 12000   |
| 2009 | 233000  | 73000  | 0      | 306000        | 0      | 1000   | 1000       | 307000  |
| 2010 | 246000  | 77000  | 0      | 323000        | 0      | 0      | 0          | 323000  |
| 2011 | 273000  | 87000  | 0      | 360000        | 0      | 0      | 0          | 360000  |
| 2012 | 228000  | 68000  | 0      | 296000        | 0      | 0      | 0          | 296000  |
| 2013 | 116000  | 60000  | 0      | 177000        | 0      | 0      | 0          | 177000  |
| 2014 | 40000   | 26000  | 0      | 66000         | 0      | 0      | 0          | 66000   |
| 2015 | 71000   | 44000  | 0      | 115000        | 0      | 0      | 0          | 115000  |
| 2016 | 0       | 0      | 0      | 0             | 0      | 0      | 0          | 0       |
| 2017 | 0       | 0      | 0      | 0             | 0      | 0      | 0          | 0       |

**Summary of the assessment**

**Table 10** Capelin in subareas 1 and 2, excluding Division 2.a west of 5°W. Assessment summary. Weights are in tonnes. Recruitment and total biomass (TSB) in 1985 and earlier are survey estimates back-calculated to 1 August (before the autumn fishing season); from 1986 and later these values are based on the survey estimates with no back-calculation. Maturing biomass (MSB) is the survey estimate of fish above the length of maturity (14.0 cm). SSB is the median value of the modelled stochastic spawning-stock biomass (after the winter/spring fishery).

| Year | Estimated stock by autumn acoustic survey 1 October |         | Predicted SSB assuming catch = ICES advised catch, April 1 in year+1 | Recruitment Age 1 survey assessment, 01 October | Capelin catches |
|------|-----------------------------------------------------|---------|----------------------------------------------------------------------|-------------------------------------------------|-----------------|
|      | TSB                                                 | MSB     |                                                                      | billions                                        |                 |
| 1972 | 6600000                                             | 2727000 | 33000                                                                | 152                                             | 1591000         |
| 1973 | 5144000                                             | 1350000 | *                                                                    | 529                                             | 1337000         |
| 1974 | 5733000                                             | 907000  | *                                                                    | 305                                             | 1148000         |
| 1975 | 7806000                                             | 2916000 | 253000                                                               | 190                                             | 1441000         |
| 1976 | 6417000                                             | 3200000 | 22000                                                                | 211                                             | 2587000         |
| 1977 | 4796000                                             | 2676000 | *                                                                    | 360                                             | 2986000         |
| 1978 | 4247000                                             | 1402000 | *                                                                    | 84                                              | 1916000         |
| 1979 | 4162000                                             | 1227000 | *                                                                    | 12                                              | 1782000         |
| 1980 | 6715000                                             | 3913000 | 316000                                                               | 270                                             | 1648000         |
| 1981 | 3895000                                             | 1551000 | 106000                                                               | 403                                             | 1986000         |
| 1982 | 3779000                                             | 1591000 | 100000                                                               | 528                                             | 1760000         |
| 1983 | 4230000                                             | 1329000 | 109000                                                               | 515                                             | 2357000         |
| 1984 | 2964000                                             | 1208000 | *                                                                    | 155                                             | 1477000         |
| 1985 | 860000                                              | 285000  | *                                                                    | 39                                              | 868000          |
| 1986 | 120000                                              | 65000   | 34000                                                                | 6                                               | 123000          |
| 1987 | 101000                                              | 17000   | *                                                                    | 38                                              | 0               |
| 1988 | 428000                                              | 200000  | 84000                                                                | 21                                              | 0               |
| 1989 | 864000                                              | 175000  | 92000                                                                | 189                                             | 0               |
| 1990 | 5831000                                             | 2617000 | 643000                                                               | 700                                             | 0               |
| 1991 | 7287000                                             | 2248000 | 302000                                                               | 402                                             | 933000          |
| 1992 | 5150000                                             | 2228000 | 293000                                                               | 351                                             | 1123000         |
| 1993 | 796000                                              | 330000  | 139000                                                               | 2                                               | 586000          |
| 1994 | 200000                                              | 94000   | 60000                                                                | 20                                              | 0               |
| 1995 | 193000                                              | 118000  | 60000                                                                | 7                                               | 0               |
| 1996 | 503000                                              | 248000  | 85000                                                                | 82                                              | 0               |
| 1997 | 909000                                              | 312000  | 94000                                                                | 99                                              | 1000            |
| 1998 | 2056000                                             | 932000  | 382000                                                               | 179                                             | 3000            |
| 1999 | 2775000                                             | 1718000 | 599000                                                               | 156                                             | 105000          |
| 2000 | 4273000                                             | 2098000 | 626000                                                               | 449                                             | 410000          |
| 2001 | 3630000                                             | 2019000 | 496000                                                               | 114                                             | 578000          |
| 2002 | 2210000                                             | 1291000 | 427000                                                               | 60                                              | 659000          |
| 2003 | 533000                                              | 280000  | 94000                                                                | 82                                              | 282000          |
| 2004 | 628000                                              | 294000  | 122000                                                               | 51                                              | 0               |
| 2005 | 324000                                              | 174000  | 72000                                                                | 27                                              | 1000            |
| 2006 | 787000                                              | 437000  | 189000                                                               | 60                                              | 0               |
| 2007 | 2119000                                             | 844000  | 330000                                                               | 222                                             | 4000            |
| 2008 | 4428000                                             | 2468000 | 517000                                                               | 313                                             | 12000           |
| 2009 | 3765000                                             | 2323000 | 504000                                                               | 124                                             | 307000          |
| 2010 | 3500000                                             | 2051000 | 487000                                                               | 248                                             | 323000          |
| 2011 | 3707000                                             | 2115000 | 504000                                                               | 209                                             | 360000          |
| 2012 | 3586000                                             | 1997000 | 479000                                                               | 146                                             | 296000          |
| 2013 | 3956000                                             | 1471000 | 399000                                                               | 324                                             | 177000          |
| 2014 | 1949000                                             | 873000  | 504000                                                               | 105                                             | 66000           |
| 2015 | 842000                                              | 375000  | 82000                                                                | 40                                              | 115000          |
| 2016 | 328000                                              | 181000  | 37000                                                                | 32                                              | 0               |
| 2017 | 2506000                                             | 1723000 | 462000                                                               | 86                                              | 0               |

\* – indicates a very small spawning stock.

## Sources and references

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