Annex4 – Quality Handbook ANNEX:NEA Haddock

Stock Annex **Haddock in Subareas I and II**

Stock specific documentation of standard assessment procedures used by ICES.

Stock	Haddock in Subareas I and II (Northeast Arctic)
Working Group:	Arctic Fisheries Working Group
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Revised by:	WKBENCH 2011 / AFWG 2011, Alexey Russkikh (stock coordinator), Gjert En dre Dingsør

A. General

A.1. Stock definition

The North-East Arctic Haddock (*Melanogrammus aeglefinus*) is distributed in the Barents Sea and adjacent waters, mainly in waters above 2° Celsius. Tagging carried out in 1953-1964 showed the contemporary area of the Northeast Arctic haddock inhabits the continental shelf of the Barents Sea, adjacent waters and polar front. The main spawning grounds are located along the Norwegian coast and area between 70°30′ and 73° N along the continental slope, but spawning also occurs as far south as 62°N. Larvae are dispersed in the central and southern Barents Sea by warm currents. The 0-group haddock drifts from the spawning grounds eastwards and northwards and during the international 0-group survey in august it is observed over wide areas in the Barents Sea. Until maturity, haddock are mostly distributed in the southern Barents Sea being their nursery area. Having matured, haddock migrate to the Norwegian Sea.

A.2. Fishery

Haddock are harvested throughout the year; in years when the commercial stock is low, they are mostly caught as bycatch in cod trawl fishery; when the commercial stock abundance and biomass are high, haddock are harvested during their target fishery. On average approximately 25% of the catch is with conventional gears, mostly longline, which are used almost exclusively by Norway. Part of the longline catches are from a directed fishery.

The fishery is restricted by national quotas. In the Norwegian fishery the quotas are set separately for trawl and other gears. The fishery is also regulated by a minimum landing size, a minimum mesh size in trawls and Danish seine, a maximum by-catch of undersized fish, closure of areas with high density/catches of juveniles and other seasonal and areal restrictions.

In recent years Norway and Russia have accounted for more than 90% of the landings. Before the introduction of national economic zones in 1977, UK (mainly England) landings made up 10–30% of the total. Each country fishing for haddock and engaged in the stock assessment provide catch statistic annually. Summary sheets in the AFWG Report indicate total yield of haddock by Subareas I, IIa and IIb, as well as catch by each country by years. Catch information by fishing gear used by Norway in the haddock fishery is used internally when making estimations at AFWG meeting. Catch quotas were introduced in the trawl fishery in 1978 and for the fisheries with conventional gears in 1989. Since January 1997 sorting grids have been mandatory for the trawl fisheries in most of the Barents Sea and Svalbard area. Discarding is prohibited.

From 01.01.2011, the minimum catching size of haddock is 40 cm in the Russian Economic zone, the Norwegian Economic zone, and the Svalbard area. It is allowed that up to 15% (by number) of the fish is below the minimum catching size of (this is counted for cod, haddock and saithe combined), larger proportions of undersized fish leads to closure of areas. The minimum mesh size in trawl cod ends is 130 mm. The fisheries are controlled by inspections at sea, requirement of reporting to catch control points when entering and leaving the EEZs and by inspections when landing the fish for all fishing vessels. Keeping a detailed fishing logbook on board is mandatory for most vessels, and large parts of the fleet report to the authorities on a daily basis. There is some evidence that the present catch control and reporting systems are insufficient to prevent discarding and under-reporting of catches. Although since 2005 Port State Control (PSC) has been implemented, these should prevent IUU catches at Barents Sea.

The historical high catch level of 320,000 t in 1973 divides the time-series into two periods. In the first period, highs were close to 200,000 t around 1956, 1961 and 1968, and lows were between 75,000 and 100,000 t in 1959, 1964 and 1971. The second period showed a steady decline from the peak in 1973 down to the historically low level of 17,300 t in 1984. Afterwards, landings increased to 151,000 t before declining to 26,000 t in 1990. A new increase peaked in 1996 at 174,000 t. Three strong year-classes (2004-2006) are causing peak catches at the present time. The exploitation rate of haddock has been variable (F between 0.2 and 0.5 in the last 20 years).

The highest fishing mortalities for haddock have occurred at intermediate stock levels and show little relationship with the exploitation rate of cod, in spite of haddock being primarily a by-catch in the cod fishery. The exception is the 1990s when more restrictive quota regulations resulted in a similar pattern in the exploitation rate for both species. It might be expected that good year classes of haddock would attract more directed trawl fishing, but this is not reflected in the fishing mortalities.

Since 2007, estimates of unreported catches (IUU catches) of haddock have been added to reported landings for the years 2002 and onwards. In 2007-2008, two assessments were presented, based on Norwegian and Russian estimates of IUU catches, respectively. The basis for the Norwegian IUU estimates (N ‑ IUU) is the annual ratio between cod and haddock in the international reported landings from Sub ‑ area I and Division II b in 2002 ‑ 2008. These ratios are assumed to be representative of the ratios in the IUU catches. The ratio is applied to the estimated IUU catches of cod in order to get the estimate for haddock. The estimates are similar to those made by the Norwegian Directorate of Fisheries for 2005-2008. The Russian estimates of IUU haddock are obtained by applying the same ratio, but using the Russian estimate of IUU catches of cod in 2002-2007. Both approaches show an increase from 2002 to 2005 followed by a decline. In 2010 the Working Group decided to set the IUU estimate for haddock in 2009 to 0. During the benchmark meeting in 2011, as in recent AFWG, it was decided to use Norwegian estimates for the period 2002-2008, because now IUU catches equal Zero and only small differences exist in final estimates using both values of IUU.

A.3. Ecosystem aspects

The composition and distribution of species in the Barents Sea depend considerably on the position of the polar front which separates warm and salty Atlantic waters from colder and fresher waters of arctic origin. Variation in the recruitment of haddock has been associated with the changes in the influx of Atlantic waters to the large areas of the Barents Sea shelf.

Independently from age and season, haddock vary their diet and will prey on plankton or benthic organisms. During spawning migration of capelin (*Mallotus villosus*) haddock prey on capelin and their eggs on the spawning grounds. When the capelin abundance is low or when their areas do not overlap, haddock can compensate by eating other fish species (e.g., young herring) or euphausiids and benthic organisms. Haddock growth rate depends on the population abundance, stock status of main prey species and water temperature.

Water temperature at the first and second years of the haddock life cycle is a fairly reliable indicator of year-class strength. If mean annual water temperature in the bottom layer during the first two years of haddock life does not exceed 3.75 C (Kola-section), the probability that strong year-classes will appear is very low even under favorable effects of other factors. A steep rise or fall of the water temperature shows a marked effect on abundance of year-classes.

Nevertheless, water temperature is not always a decisive factor in the formation of year-class abundance. Strength of year-classes is also determined to a great extent by size and structure of the spawning stock. Under favorable environmental conditions, strong year classes are mainly observed in years when the spawning stock is dominated by individuals from older age groups with abundance at a fairly high level.

Annual consumption of haddock by marine mammals, mostly seals and whales, depends on stock status of capelin as their main prey. In years when the capelin stock is large the importance of haddock in the diet of marine mammals is minimal, while under the capelin stock reduction a considerable increase in consumption by marine mammals of all the rest abundant gadoid species including haddock is observed (Korzhev and Dolgov, 1999; Bogstad et al, 2000).

The appearance of strong haddock year classes usually leads to a substantial increase in natural mortality of juveniles as a result of cod predation.

B. Data

B.1. Commercial catch

Norway

Norwegian commercial catch in tonnes by quarter, area and gear are derived from the sales notes statistics of The Directorate of Fisheries. Data from about 20 sub-areas are aggregated on 6 main areas for the gears gill net, long line, hand line, purse seine, Danish seine, bottom trawl, shrimp trawl and trap. For the bottom trawl, the quarterly area distribution of the catches is adjusted by logbook data from The Directorate of Fisheries and the total bottom trawl catch by quarter and area is adjusted so that the total annual catch for all gears is the same as the official total catch reported to ICES. No discards are reported or accounted for.

The sampling strategy is to have age and length samples from all major gears in each main area and quarter. The main sampling program is sampling the landings. Additional samples from catches are obtained from the coast guard, from observers and from crew members reporting, according to an agreed sampling procedure (reference fleet).

The age distribution and weight at age for the Norwegian catches were estimated using the software based on the method of Hirst *et al*. (2005). In this method, the three different types of available samples (age and weight samples, age and weight stratified by length groups, and length samples) are modelled simultaneously using a previously developed Bayesian hierarchical model (Hirst *et al*., 2004). This method replaced the traditional method in 2006, and the time series of Norwegian catch at age (early 80's and onward) was updated based on the modelling approach. The old method involved allocating unsampled catches to sampled catches based on judgements on "distance criteria's" (in area, time and sometimes gear) and the use of ALK's to fill holes in the sampling frame.

Russia

Russian commercial catch in tonnes by season and area are derived from the Russian Federal Research Institute of Marine Fisheries and Oceanography (VNIRO, Moscow) statistics department. Data from each fishing vessel are aggregated on three ICES sub-Division (I, IIa and IIb). Russian fishery by passive gears was almost stopped by the end of the 1940s. Until late 1990's, relative weight (percentage) of haddock taken by bottom trawls in the total Russian yield exceeded 99%. Only in recent years an upward trend in a proportion of Russian long-line fishery for haddock was observed to be up to 5% on the average and long-line catches were taken into account for estimation catch-at-age matrix.

The sampling strategy was to conduct mass measurements and collect age samples directly at sea, onboard both research and commercial vessels to have age and length distributions from each area and season. Data on length distribution of haddock in catches are collected in areas of cod and haddock fishery all the year round by a "standard" fishery trawl and summarized by three ICES sub-areas (I, IIa and IIb).

Age sampling was carried out in two ways: without any selection (otoliths were taken from any fish caught in one trawl, usually from 100-300 sp.) or using a stratified by length sampling method (i.e. approximately 10-15 sp. per each 10-cm length group). The last method has been used since 1988.

All fish taken for age-reading were measured and weighted individually.

Data on length distribution of haddock catches, as well as age-length keys, are formed for each ICES Subarea, each fishing gear (trawl and longline) for the whole year. Catch at age are reported to ICES AFWG by sub-Division (I, IIa and IIb) for the whole year. In the lack of data by ICES Subareas, information on size-age composition of catches from other areas is used.

Germany

Catch at age were reported to the WG by ICES sub-Division (I, IIa and IIb) according to national sampling. Missing sub-Divisions were filled in by use of Russian or Norwegian sampling data.

Other nations

Total annual catch in tonnes is reported by ICES sub-Divisions or by Russian and Norwegian authorities directly to WG. All catches by other nations are taken by trawl. The age composition from the sampled trawl fleets is therefore applied to the catches by other nations.

Table below shows which country supplied which kind of data:

	Kind of data				
Country	Caton (catch in weight)	Canum (catch at age in numbers)	Weca (weight at age in the catch)	Matprop (proportion mature by age)	Length composition in catch
Norway	X	X	X	X	X
Russia	X	X	X	X	X
Germany	X	X	X		X
United Kingdom	X				
France	X				
Spain	X				
Portugal	X				
Ireland	X				
Greenland	X				
Faroe Islands	X				
Iceland	X				
Poland	X				
Belarus	X				

The combined catch data were previously estimated by the SALLOC program (Patterson, 1998). The national data from 2009 and onwards are available in Intercatch (ICES database); earlier data should be found in the national laboratories and with the stock coordinator.

For 1983 and later years mean weight at age in the catch is calculated as the weighted average for the sampled catches. For the earlier period (1946-1982) mean weight at age in catches is set equal to mean weight at age in the catch for period 1983-2009.

The result files can be found at ICES (sharepoint) and with the stock co-ordinator as ASCII files on the Lowestoft format.

B.2. Biological

Weights and length at age in stock and proportion of mature fish to ages 1–11 derived from Russian surveys in autumn (mostly October-December) and Norwegian surveys in January-March for the period from 1983 and onwards. In 2006 the AFWG, based on WKHAD06 investigations, decided to smooth raw data of stock weight-at-age and maturity-at-age using models in order to remove some of the sampling variability in the estimates.

Mean length-at-age is calculated from the bottom trawl surveys. A von Bertalanffy function is fitted to the data:

$$L = L_{\infty} - L_{\infty} \cdot e^{(-K_Y(A-A_0))}$$

with L and A being the length and age variables. L_∞ and A_0 are constants, estimated on the entire time series, while K_Y is dependent on year-class. Weight-at-age is then fitted with:

$W = \alpha \cdot L^\beta$

where α and β are constants and L are smoothed lengths.

Norwegian maturity data is smoothed by fitting a logistic function using both age, A, and length, L, as explanatory variables:

$$\log\left(\frac{m}{1-m}\right) = I + \alpha A + \beta L$$

Russian maturity data is smoothed by fitting a logistic function using age, A, and year-class dependent age at 50% maturity, $A_{50\%}$, as explanatory variables:

$$Mat = \frac{1}{1 + e^{(-\alpha \cdot (A - A_{50\%}))}}$$

Estimates were produced separately for the Russian autumn survey and the joint winter survey and were later combined using an arithmetic average. These averages are assumed to give representative values for the beginning of the year.

Norwegian lengths-at-age are used to estimate mean weights-at-age and maturity-at-age for the period 1980-1982.

The combined data on weight-at-age in stock and proportion of mature fish by age group for the period (1950-1979) are set equal to mean values for period 1980-2010.

Natural mortality used in the assessment is estimated as 0.2 + mortality from predation by cod. The estimated consumption of NEA haddock by NEA cod is incorporated into the XSA analysis on first step by constructing catch-at-age matrix, adding estimated numbers of haddock eaten by cod to the catches for the ages 1-6, for years where such data are available (1984–present). The fishing mortality estimated by the XSA is split into the mortality caused by the fishing fleet (F) and the mortality caused by the cod's predation (M2) according to the ratio of fleet catch and predation "catch". The new natural mortality data set were then prepared by adding 0.2 (M1) to the predation mortality. This new M matrix is used in the final XSA. Natural mortality for period without observations (1950-1983) is replaced by mean values for period 1984-2010.

Both the proportion of natural mortality before spawning (Mprop) and the proportion of fishing mortality before spawning (Fprop) are set to 0. The peak spawning occurs most years in the middle of April.

B.3. Surveys

Russian surveys of cod and haddock in the southern Barents Sea started in the late 1940s as trawl surveys of young demersal fishes. Since 1957 such surveys have been conducted over the whole feeding area including the Bear Island - Spitsbergen area (Baranenkova, 1964; Trambachev, 1981); both young and adult haddock have been surveyed simultaneously. Duration of the survey has declined from 5-6 months (September-February) in 1946-1981 to 2-2.5 months (October-December) since 1982. The aim of the survey is to investigate both the commercial size haddock as well as the young haddock. The survey covers the main areas where juveniles settle to the bottom, as well as the area where the commercial fishery takes place. A total number of more than 400 trawl hauls are conducted during the survey (mainly bottom trawl, a few pelagic trawls). In 1984, acoustic methods started to be implemented during surveys of fish stocks (Zaferman and Serebrov, 1984; Lepesevich and Shevelev, 1997; Lepesevich *et al.*, 1999). From 1995 onwards there has been a substantial change in the method for calculating acoustic indices, which allowed the differentiation and registration of echo intensities from fish of different length (Shevelev *et al.*, 1998).

There are two survey abundance indices at age: 1) absolute numbers (in thousands) computed from the acoustics estimated by the new method (RU-Aco-Q4) for the period 1995-2009 (ages 0-10); 2) trawl index, calculated as relative numbers per hour trawling (RU-BTr-Q4) for the period 1983-2009 (ages 0-9).

The indices (RU-Aco-Q4) were not used for tuning the XSA due to a strong "year effect" observed in years with incomplete area coverage. This index needs further adjusting before it can be used for tuning. Based on internal consistency test the RU-BTr-Q4 index is used in tuning for ages 1-7.

Norwegian winter (February) survey (from 2000 - Joint Barents Sea survey, NoRu-BTr-Q1 and NoRu-Aco-Q1)

The survey started in 1981 and covers the ice-free part of the Barents Sea. Both swept area estimates from bottom trawl and acoustic estimates are produced. The swept area estimates are used in the tuning for ages 1-8. The survey is described in Jakobsen *et al*. (1997) and Aglen *et al*. (2002).

Before 2000 this survey was made without participation from Russian vessels, while in the three latest surveys Russian vessels have covered important parts of the Russian zone. The indices for 1997 and 1998, when the Russian EEZ was not covered, have been adjusted as reported previously (Mehl, 1999). The number of fish (age group by age group) in the Russian EEZ in 1997 and 1998 was interpolated assuming a linear development in the proportion found in the Russian EEZ from 1996 to 1999. These estimates were then added to the numbers of fish found in the Norwegian EEZ and the Svalbard area in 1997 and 1998.

It should be noted that the survey conducted in 1993 and later years covered a larger area compared to previous years (Jakobsen *et al*. 1997). Other changes in the survey methodology through time are described by Jakobsen *et al*. (1997). Note that the change from 35 to 22 mm mesh size in the cod-end in 1994 has not been corrected for in the time series. This mainly affects the age 1 indices. There are two abundance indices at age from that survey used in stock assessment:

1) swept area estimates from bottom trawl NoRu-BTr-Q1 for the period 1981-2010 (ages 1-10);

2) swept area estimates from acoustic NoRu-Aco-Q1 for the period 1981-2010 (ages 1-10).

For tuning XSA used: NoRu-BTr-Q1 for (ages 1-8) and NoRu-Aco-Q1 for ages 1-7.

Joint Norwegian-Russian Ecosystem survey (Eco-NoRu-Btr-Q3)

The bottom trawl estimates from the joint ecosystem survey in August-September, starting in 2004. This survey covers a larger portion of the distribution area of haddock. The new index Eco-NoRu-Btr-Q3 for period 2004-2009 ages 1-8 became available for AFWG 2010. This time series have been tested as new tuning fleet in XSA and it was found that the index was acceptable for use in the NEA haddock assessment.

Based on the test made during WKBENCH 2011 and previous AFWG work it is decided to use only tuning indices for the period 1990 and onwards.

B.4. Commercial CPUE

Russia

No Russian data are used in the stock assessment.

Norway

Historical time series of observations onboard Norwegian trawlers were earlier used for tuning of older age groups in VPA. The basis was catch per unit effort (CPUE) in Norwegian statistical areas 03, 04 and 05 embracing coastal banks north of Lofoten, on which approximately 70% of Norwegian haddock catch was taken. However, the proportion of haddock taken as by-catch is pretty high and thus it is difficult to estimate their actual catch per unit effort. Since 2002, CPUE indices have not been used in XSA tuning.

B.5. Other relevant data

Not used.

C. Assessment: data and method

Model used: XSA

Software used: FLR suite (and VPA95 suite)

Model Options chosen:

Tapered time weighting applied, power = 3 over 20 years

Catchability independent of stock size for ages > 8

Catchability independent of age for ages > 8

Survivor estimates shrunk towards the mean F of the final 5 years or the 3 oldest ages

S.E. of the mean to which the estimate are shrunk = 1.500[1]

Minimum standard error for population estimates derived from each fleet = 0.300

Prior weighting not applied

[1] During the benchmark in 2011 (ICES 2011) it was decided that the AFWG 2011should evaluate different options for this value and make the final decision on the appropriate value. The AFWG 2011 decided to change this setting from 0.5 to 1.5.

Input data types and characteristics:

Type	Name	Year range	Age range	Variable from year to year Yes/No
Caton	Catch in tonnes	1950 – last data year	3 – 11+	Yes
Canum	Catch at age in numbers	1950 – last data year	3 – 11+	Yes
Weca	Weight at age in the commercial catch	1983 – last data year	3 – 11+	Yes, set equal to west for 1950-1982
West	Weight at age of the stock at start of year.	1950 – last data year	3 – 11+	Yes
Mprop	Proportion of natural mortality before spawning	1950 – last data year	3 – 11+	No – set to 0 for all ages in all years
Fprop	Proportion of fishing mortality before spawning	1950 – last data year	3 – 11+	No – set to 0 for all ages in all years
Matprop	Proportion mature at age	1950 – last data year	3 – 11+	Yes, set equal to average for 1950-1980
Natmor	Natural mortality	1950 – last data year	3 – 11+	Includes annual est. of predation by cod from 1984, otherwise set to 0.2 for all ages in all years

Tuning data:

Type	Name	Year range	Age range
Tuning fleet 1 (RU-BTr-Q4)	Russian bottom trawl survey, October-December	1991 – last data year	3-7 (1-7 in predation run)
Tuning fleet 2 (BS-NoRu-BTr-Q1)	Joint Norwegian-Russian trawl survey, February	1990 – last data year	3 – 8 (1-8 in predation run)
Tuning fleet 3 (BS-NoRu-Aco-Q1)	Joint Norwegian-Russian Acoustic survey, February	1990 – last data year	3 – 7 (1-7 in predation run)
Tuning fleet 4 (Eco-NoRu-Btr-Q3)	Joint Norwegian-Russian Ecosystem survey	2004 – last data year	3 – 8 (1-8 in predation run)

D. Short-Term Projection

Model used: Age structured

Software used: R and FLR suite, MFDP with management option table and yield per recruit routines

Initial stock size: Estimated in XSA as abundance of individuals that survive the terminal year for age 3 and older.

Recruitment at age 3 for the start year and the 2 consecutive years is estimated from survey data in RCT3 using the tuning series as input.

F and M before spawning: assumed equal to 0 for all ages in all years

Maturity: for current year smoothed actual data combined by Russian and Norwegian surveys are used; for subsequent years – using the fitted parameters and last year maturity as input.

Weight at age in the stock: for current year smoothed actual data combined by Russian and Norwegian surveys are used, for two years ahead, using the fitted parameters and last year lengths as input.

The Norwegian and Russian weight-at-age and maturity-at-age are then combined as arithmetic averages.

Weight at age in the catch and natural mortality: show strong patterns related to periods of good recruitment. The Working Group believes that the estimated recruitment in the most recent years is so high that it will affect growth. The Working Group therefore decided to use similar trends in weight at age, and natural mortality as has been observed in previous periods following good recruitment.

Exploitation pattern: For current year it is taken to be at the level of previous year ($F_{Status\ quo}$) or to be equal to average for the recent 3 years; for subsequent years method used to determine this parameter and its substantiation are given in the AFWG Reports. In 2010 the average fishing pattern observed in the 3 last years, scaled to F status quo was used for distribution of fishing mortality at age for 2010-2012.

Intermediate year assumptions:

Stock recruitment model used: None

Procedures used for splitting projected catches: Not relevant

E. Medium-Term Projections

Not used in assessment.

F. Long-Term Projections

Not used in assessment.

G. Biological Reference Points

	Type	Value	Technical basis
MSY Approach	MSY $B_{trigger}$	80 000 t	$B_{trigger}=B_{pa}$
	F_{MSY}	0.35	Stochastic long-term simulations
Precautionary Approach	B_{lim}	50 000 t	B_{loss}
	B_{pa}	80 000 t	B_{lim}*exp(1.645*σ), where σ=0.3
	F_{lim}	0.77	SSB=B_{lim}, SPR value of slope of line from origin at SSB=0 to geometric mean recruitment
	F_{pa}	0.47	F_{lim}*exp(-1.645*σ), where σ=0.3

H. Other Issues

H.1. Historical overview of previous assessment methods (this subsection is optional. See example below.)

Summary of data ranges used in recent assessments:

Data	2006 assessment	2007 assessment	2008 assessment	2009 assessment	2010 assessment
Catch data	Years:1950–2005 Ages: 1–11+	Years: 1950–2006 Ages: 1–11+	Years: 1950–2007 Ages: 1–11+	Years: 1950–2008 Ages: 1–11+	Years: 1950–2009 Ages: 1–11+
Cod consumption data	Available: Years 1984–2005 Ages: 0–6 Used ages: 1-6	Available: Years1984–2006 Ages: 0–6 Used ages: 1-6	Available: Years1984–2007 Ages: 0–6 Used ages: 1-6	Available: Years1984–2008 Ages: 0–6 Used ages: 1-6	Available: Years1984–2009 Ages: 0–6 Used ages: 1-6
Fleet 01 Survey: RU-BTr-Q4	Available: Years1983-2005 Ages 0+ 9 Used 1991-2005 ages: 1–7	Available: Years1983-2006 Ages 0+ 9 Used 1991-2006 ages: 1–7	Available: Years1983-2007 Ages 0+ 9 Used 1991-2007 ages: 1–7	Available: Years1983-2008 Ages 0+ 9 Used 1991-2008 ages: 1–7	Available: Years1983-2009 Ages 0+ 9 Used 1991-2009 ages: 1–7
Fleet 02 Survey: NoRu-Aco-Q1	Available: Years1980-2006 Ages 1 10+ Used: shifted 1990-2005 ages: 1–7	Available: Years1980-2007 Ages 1 10+ Used: shifted 1990-2006 ages: 1–7	Available: Years1980-2008 Ages 1 10+ Used: shifted 1990-2007 ages: 1–7	Available: Years1980-2009 Ages 1 10+ Used: shifted 1990-2008 ages: 1–7	Available: Years1980-2010 Ages 1 10+ Used: shifted 1990-2009 ages: 1–7
Fleet 04 Survey: NoRu-BTr-Q1	Available: Years1982-2006 Ages 1 10+ Used: shifted 1990-2005 ages: 1–8	Available: Years1982-2007 Ages 1 10+ Used: shifted 1990-2006 ages: 1–8	Available: Years1982-2008 Ages 1 10+ Used: shifted 1990-2007 ages: 1–8	Available: Years1982-2009 Ages 1 10+ Used: shifted 1990-2008 ages: 1–8	Available: Years1982-2010 Ages 1 10+ Used: shifted 1990-2009 ages: 1–8

(The historic perspective, as well as all the other section on the stock annex, should only update in a benchmark workshop. If there is any reason to deviate from the stocks annex, this should be explain in the Working Group report and only update this deviation in the historic perspective after consultation with ICES Secretariat and WG Chair).

Harvest control rule

The harvest control rule (HCR) was evaluated by ICES in 2007 (AFWG 2007) and found to be in agreement with the precautionary approach. The agreed HCR for haddock is as follows (Protocol of the 36th Session of The Joint Norwegian Russian Fishery Commission, 10 October 2007):

- *TAC for the next year will be set at level corresponding to* F_{pa}.
- *The TAC should not be changed by more than +/- 25% compared with the previous year TAC.*
- *If the spawning stock falls below* B_{pa}*, the procedure for establishing TAC should be based on a fishing mortality that is linearly reduced from* F_{pa} *at* B_{pa} *to F= 0 at SSB equal to zero. At SSB-levels below* B_{pa} *in any of the operational years (current year and a year ahead) there should be no limitations on the year-to-year variations in TAC.*

At the 39th Session of The Joint Norwegian Russian Fishery Commission in 2010 it was agreed that this HCR should be left unchanged for 5 years and then re-evaluated.

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