Herring (*Clupea harengus*) in Subarea 4 and divisions 3.a and 7.d, autumn spawners (North Sea, Skagerrak and Kattegat, eastern English Channel)

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in 2024 should be no more than 532 166 tonnes.

Catches of Western Baltic Spring-Spawning (WBSS) herring in the fishery for North Sea autumn-spawning herring in the east of 4.a and 4.b should be kept as low as possible.

ICES advice on conservation aspects

ICES advises that no activities on spawning habitats should be allowed unless the effects of these activities have been assessed and shown not to be detrimental.

Stock development over time

Fishing pressure on the stock is below F_{MSY} and the spawning-stock size is above MSY $B_{trigger}$, B_{pa} and B_{lim}.

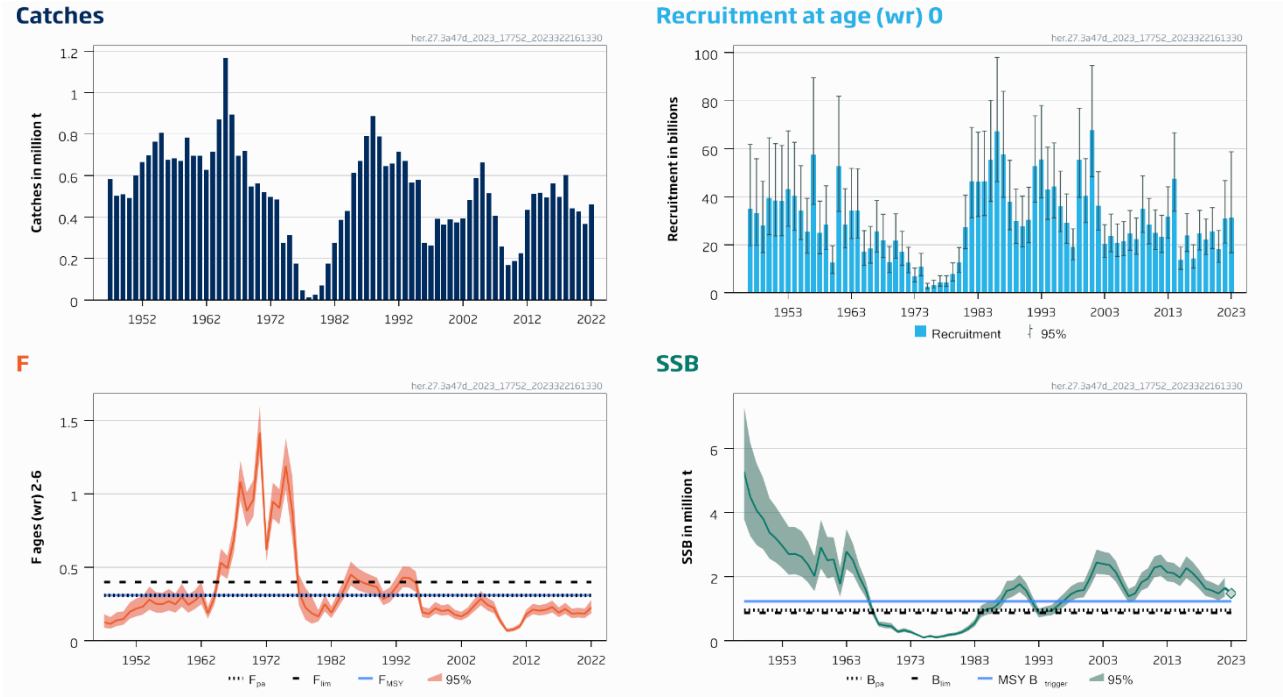

Figure 1 Herring in Subarea 4 and divisions 3.a and 7.d, autumn spawners. Summary of the stock assessment. The grey diamond in the SSB plot is a predicted biomass for 2023 at spawning time. *wr* is winter ring.

Conservation status

ICES is not aware of any information on stock/species-specific conservation status.

Catch scenarios

Table 1 Herring in Subarea 4 and divisions 3.a and 7.d, autumn spawners. The basis for the catch scenarios. All weights are in tonnes, and recruitment is in thousands.

Variable	Value	Notes
$F_{ages2–6\ (wr)}$ (2023)	0.238	Based on 2023 total assumed catches
SSB (2023)	1 480 607	Calculated based on catch constraint
$R_{age\ 0\ (wr)}$ (2023)	31 349 400	Estimated by assessment model
$R_{age\ 0\ (wr)}$ (2024)	23 566 820	Weighted mean by standard deviation over 2013–2022
Total catch (2023)	422 211	• A-fleet: 413 245 t. Fleet TAC (396 556 t) + C-fleet TAC transfer to the North Sea (21 971 t), scaled by the 3-year average proportion of NSAS in A-fleet catch (98.7%, 2020–2022). • B-fleet: 8279 t. Fleet TAC (7716 t) + D-fleet TAC transfer (50%) to the North Sea (3330 t), scaled with the fleet uptake in 2022 (75%). • C-fleet: 331 t. Fleet catches in 3.a of 770 t (310 t agreed maximum Norwegian catch and 47.5% (proportion of C-fleet EU catches in the total EU catches in 3.a in 2022) of 969 t agreed maximum EU catch), scaled by the 3-year average proportion of NSAS in the C-fleet catch (43%, 2020–2022). • D-fleet: 355 t. Fleet catches based on 52.5% (proportion of D-fleet catches in the total EU catches in 3.a in 2022) of 969 t agreed maximum EU catch, scaled by the 3-year average proportion of NSAS in the D-fleet catch (70%, 2020–2022).

Table 2 Herring in Subarea 4 and divisions 3.a and 7.d, autumn spawners. The intermediate year (2023) assumptions. Weights are in tonnes.

F by fleet and total						NSAS catches by fleet				SSB 2023
$F_{ages\ (wr)\ 2–6}$ A-fleet	$F_{ages\ (wr)\ 0–1}$ B-fleet	$F_{ages\ (wr)\ 1–3}$ C-fleet	$F_{ages\ (wr)\ 0–1}$ D-fleet	$F_{ages\ (wr)\ 2–6}$	$F_{ages\ (wr)\ 0–1}$	Catches A-fleet	Catches B-fleet	Catches C-fleet	Catches D-fleet	
0.237	0.024	0	0.001	0.238	0.03	413 245	8 279	331	355	1 480 607

Table 3 Herring in Subarea 4 and divisions 3.a and 7.d, autumn spawners. Annual catch scenarios. All weights are in tonnes.

Basis	F values by fleet and total						NSAS catches by fleet				Total stock catch	Biomass*				% Advice change^
	A-fleet $F_{ages\ (wr)\ 2–6}$	B-fleet $F_{ages\ (wr)\ 0–1}$###	C-fleet $F_{ages\ (wr)\ 1–3}$	D-fleet $F_{ages\ (wr)\ 0–1}$	Total $F_{ages\ (wr)\ 2–6}$	Total $F_{ages\ (wr)\ 0–1}$	A-fleet	B-fleet	C-fleet#	D-fleet#		SSB 2024	SSB 2025**	%SSB change***	A-fleet %TAC change****	
ICES advice basis																
MSY approach	0.31	0.031	0	0	0.31	0.038	522 832	9 334	0	0	532 166	1 482 555	1 549 993	0.1	31.8	28.3
Other scenarios																
F = 0	0	0	0	0	0	0	0	0	0	0	0	1 812 157	2 329 793	22.4	−100	−100
$F = F_{2023}$	0.238	0.024	0	0	0.238	0.029	414 291	7 195	0	0	421 486	1 552 921	1 698 171	4.9	4.5	1.6
F_{pa}	0.31	0.031	0	0	0.31	0.038	522 832	9 334	0	0	532 166	1 482 555	1 549 993	0.1	31.8	28.3
F_{lim}	0.4	0.041	0	0	0.4	0.049	648 316	11 969	0	0	660 285	1 399 814	1 387 573	−5.5	63.5	59.1
$SSB_{2024} = B_{pa}$	1.012	0.103	0	0	1.013	0.124	1 281 303	29 074	0	0	1 310 377	956 483	711 127	-35.4	223.1	215.8
$SSB_{2024} = B_{lim}$	1.161	0.118	0	0	1.161	0.142	1 391 641	33 025	0	0	1 424 666	874 198	616 998	-41	250.9	243.4
$SSB_{2024} = MSY\ B_{trigger}$	0.601	0.061	0	0	0.601	0.074	894 497	17 745	0	0	912 242	1 232 828	1 096 403	−16.7	125.6	119.9
MSY approach with $F_{ages\ 0–1}$ = 0.05 target ##	0.31	0.044	0	0	0.31	0.05	522 657	12 838	0	0	535 495	1 482 489	1 547 420	0.1	31.8	29.1
MSY approach with C-fleet catches and C- and D-fleet TAC transfer ####	0.309	0.043	0.001	0.008	0.31	0.057	521 847+	12 615++	720	2 323	537 505	1 482 270	1 545 267	0.1	31.6	29.6
MSY approach with C- and D-fleet catches and no C- and D-fleet TAC transfer ####	0.302	0.031	0.01	0.016	0.31	0.054	510 036	9 066	12 788	4 645	536 535	1 479 326	1 536 122	−0.1	28.6	29.3

* For autumn-spawning stocks, the SSB is determined at spawning time and is influenced by fisheries and natural mortality between 1 January and spawning.

** Assuming same catch scenario in 2025 as in 2024.

*** SSB (2024) relative to SSB (2023).

**** A-fleet catches (2024) relative to TAC 2023 for the A-fleet (396 556 tonnes).

^ Advice value 2024 relative to advice value 2023, using catches for all fleets (403 813 tonnes).

+ Includes a C-fleet TAC transfer of 94.5% (27 833 t).

++ Includes a D-fleet TAC transfer of 50% (3 330 t).

The catch for C- and D-fleets in 3a are set to zero because of the zero catch advice given for 2024 for the western Baltic spring-spawning herring stock.

B-fleet fishing pressure set independently on change in the A-fleet fishing pressure (ICES, 2023b).

Fishing pressure inclusive of catches induced by D- fleet transfer.

Estimated 2024 C-fleet TAC based on historical TAC setting: $TAC_C = (5.7\% * TAC_A) + (TAC_{SD22\text{-}24} * 41\% * 2)$. In 2024, $TAC_{SD22–24}$ = 788 t, in line with the 2023 TAC. D-fleet TAC of 6 659 t, in line with the 2023 TAC.

The basis for the 28.3% increase of catch advice is threefold. First, the SSB in 2022 is estimated to be 32.5% larger than that predicted in the previous advice. Second, the recruitment in 2022 (2021 year class) is now estimated to be 87.3% larger than that estimated in the previous advice. The contribution of this year class to the SSB in the advice year is 32.6%. Third, the SSB in the advice year is forecast to be above MSY $B_{trigger}$, leading to a fishing advice in 2024 at F_{MSY} rather than below F_{MSY} (as was the situation in 2023).

Basis of the advice

On fishing opportunities

Table 4 Herring in Subarea 4 and divisions 3.a and 7.d, autumn spawners. The basis of the advice.

Advice basis	MSY approach
Management plan	ICES is not aware of any agreed precautionary management plan for herring in this area

On the conservation aspects

Table 5 Herring in Subarea 4 and divisions 3.a and 7.d, autumn spawners. The basis of the advice.

Advice basis	Ecosystem-based management (EBM) considerations
Existing conservation measures	ICES is not aware of any conservation measures for this stock.

Quality of the assessment

The updated assessment has revised up estimates of SSB in recent years. The fishing mortality is consistent with last year.

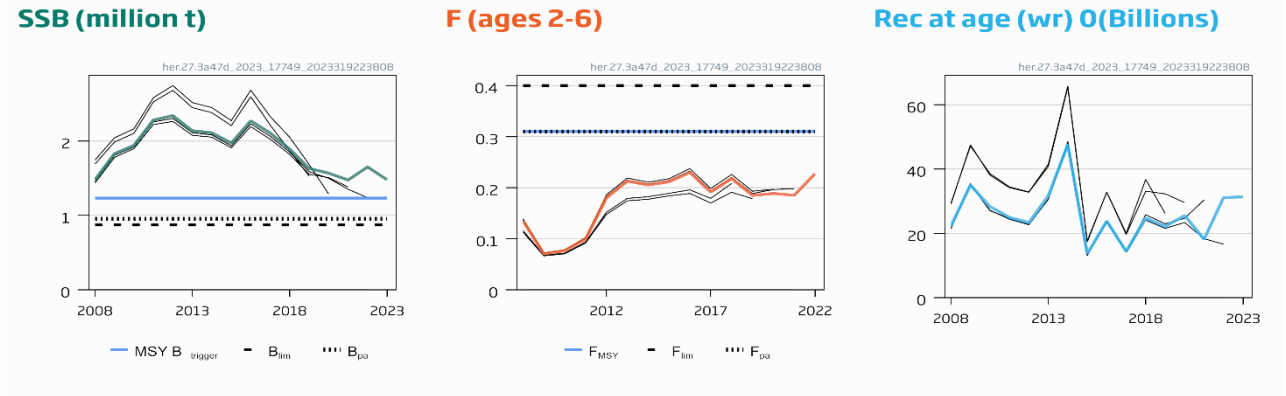

Figure 2 Herring in Subarea 4 and divisions 3.a and 7.d, autumn spawners. Historical assessment results. Final-year recruitment included for each line. The reference points were revised in 2021 following an interbenchmark, and only assessment results from the last three years should be compared to the reference points indicated.

Issues relevant for the advice

On the fishing opportunities

Signs of strong incoming recruitment. It is estimated that the recruitment for the stock was low over the period 2015–2021. In contrast, the 2022 recruitment (2021 year class) is substantially higher, following IBTS-Q1 and IBTS-Q3 survey results. The newly-built time-series on sampling late herring larvae in April suggests a strong contribution of the later spawned component in the southern North Sea (including the Downs component) to the overall recruitment.

SSB increase. An overall increase of stock level is estimated for 2022. It is expected that the strong 2022 recruitment (2021 year class) will contribute positively to SSB levels from 2024 onwards (32.6%).

Several spawning components of herring where protection measures should be continued. North Sea autumn spawners (NSAS) have several spawning components, including the Downs herring that spawns in divisions 4.c and 7.d. These

components are fished on individual spawning grounds and in a mixed-component fishery in the central and northern North Sea. To help protect the Downs component, sub-TACs have been set for divisions 4.c and 7.d. A long-term management plan should be developed to ensure the maximum productivity of the stock and protect all components.

Fleet definition as used in the advice. When addressing NSAS catch options, catch by the A-, B-, C-, and D-fleets in Subarea 4 and divisions 3.a and 7.d have to be considered all at once. The input catch data are disaggregated in these different fleets based on assumptions that deviate from the definition of those fleets for management purposes (based on TAC settings). In the context of this advice, the fleets are currently described as follows:

Fleet A: Directed fishery for herring for human consumption in the North Sea and Division 7.d, but includes herring bycatches in the Norwegian industrial fishery. The catch of herring is almost exclusively NSAS herring, with some catches of WBSS herring in the eastern part of Subarea 4.

Fleet B: Bycatch industrial fleet of EU nations targeting sprat, Norway pout, and sandeel, operating in the North Sea. The catch of herring is assumed to be exclusively NSAS herring.

Fleet C: Directed fishery for herring for human consumption in Kattegat and Skagerrak (Division 3.a). This fleet also includes catches from the Swedish D-fleet until 2021. The catch of herring consists of a mixture of NSAS and WBSS herring.

Fleet D: Bycatch of herring in Kattegat and Skagerrak (Division 3.a) in the Danish and, from 2022, the Swedish small-meshed industrial fleet for sprat, Norway pout, and sandeel. The catch of herring consists of a mixture of NSAS and WBSS herring.

Interarea flexibility. Interarea transfers from Division 3.a to the North Sea have resulted in an increase in catches of NSAS and a decline in catches of WBSS. The transfer for 2023 is not yet known. The implications of the transfer may not be fully accounted for in the headline ICES MSY advice for 2024.

Catches of WBSS herring in eastern parts of 4a and 4b requires new management measures. ICES advises zero catches for WBSS herring. The catches of WBSS in the North Sea in recent years have been substantial (estimated at 5 236 t based on the average over the 2020–2022 period). The catches of WBSS in 2023 are expected to continue to be larger in the North Sea than in subdivisions 20–24. Without additional area and seasonal restrictions on the herring fishery in the North Sea in 2024, catches of WBSS in the North Sea will be unavoidable, delaying the recovery of the WBSS stock.

On the conservation aspects

No activities that have a negative impact on spawning habitats should be allowed. Activities that might have a negative impact on the spawning habitat of herring (e.g. extraction of gravel, building of wind farms) should not occur unless the effects of these activities have been assessed and shown to be non-detrimental. Gravel substratum is an essential habitat for herring spawning in autumn.

At present, ICES is not fully able to quantify the level and relative impact of cumulative non-fisheries anthropogenic factors on the reproductive capacity of the stock. ICES is aware that there are non-fisheries anthropogenic impacts (e.g. spawning habitat degradation) that may decrease the early life-stage survival of herring.

Reference points

Table 5 Herring in Subarea 4 and divisions 3.a and 7.d, autumn spawners. Reference points, values, and their technical basis. Weights are in tonnes.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	1 232 828	50th percentile of biomass at F_{MSY}	ICES, 2021a
	F_{MSY}	0.31	Stochastic simulations (EqSim) with a segmented regression stock–recruitment curve fitted to data from the low productivity period (2002–2020) assuming a break-point at B_{lim}	ICES, 2021a
Precautionary approach	B_{lim}	874 198	Breakpoint in the segmented regression of the stock–recruitment time-series (1947–2016, excluding the recovery period 1979–1990)	ICES, 2021a
	B_{pa}	956 483	$B_{pa} = B_{lim} \times \exp(1.645 \times \sigma)$ with $\sigma \approx 0.06$, based on the σ from the terminal assessment year	ICES, 2021a
	F_{lim}	0.40	The F that, on average, leads to B_{lim}	ICES, 2021a
	F_{pa}	0.31	The maximum F that provides a 95% probability for SSB to be above B_{lim} (F_{P05} with advice rule [AR])	ICES, 2021a

Basis of the assessment

Table 6 Herring in Subarea 4 and divisions 3.a and 7.d, autumn spawners. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2023a)
Assessment type	Age-based analytical assessment, SAM (ICES, 2023b) that uses catches in the model and in the forecast
Input data	Commercial catches disaggregated by fleets and split for NSAS/WBSS. Five survey indices: IBTS-Q1 1-ringer (G1022); IBTS0 (I8304); LAI as SSB index (I2359, I9086, I2687); HERAS 1–8-ringers (includes split for NSAS/WBSS, A5092); IBTS-Q3 0–5-ringers (G2829). Annual maturity data from HERAS survey; natural mortalities from SMS North Sea multispecies model (ICES, 2021b).
Discards	Discarding is considered to be negligible
Indicators	None
Other information	This stock was interbenchmarked, and reference points were updated in 2021 (ICES, 2021a)
Working group	Herring Assessment Working Group for the Area South of 62°N (HAWG)

History of the advice, catch, and management

Table 7 Herring in Subarea 4 and divisions 3.a and 7.d, autumn spawners. ICES advice, TACs, official landings, and ICES catch estimates. All weights are in tonnes.

Year	ICES advice	Predicted catch corresponding to advice	Agreed TAC*	B-fleet###	ICES landings in 4, 7.d#	ICES catch in 4, 7.d##	ICES catch of autumn spawners in 3.a, 4, 7.d
1987	TAC	610 000	600 000		625 000	625 000	792 000
1988	TAC	515 000	530 000		710 000	710 000	888 000
1989	TAC	514 000	514 000		669 000	717 000	787 000
1990	TAC	403 000	415 000		523 000	578 000	646 000
1991	TAC	423 000	420 000		537 000	588 000	657 000
1992	TAC	406 000	430 000		518 000	572 000	716 000
1993	No increase in yield at F > 0.3	340 000	430 000		495 000	540 000	671 000
1994	No increase in yield at F > 0.3	346 000	440 000		463 000	498 000	571 000
1995	Long-term gains expected at lower F	429 000	440 000		510 000	516 000	579 000
1996	50% reduction of agreed TAC**	156 000	156 000***	44 000	207 000	233 000	275 000
1997	F = 0.2	159 000	159 000	24 000	175 000	238 000	264 000
1998	F(adult) = 0.2, F(juv) < 0.1	254 000	254 000	22 000	268 000	338 000	392 000
1999	F(adult) = 0.2, F(juv) < 0.1	265 000	265 000	30 000	290 000	333 000	363 000

Year	ICES advice	Predicted catch corresponding to advice	Agreed TAC*	B-fleet###	ICES landings in 4, 7.d#	ICES catch in 4, 7.d##	ICES catch of autumn spawners in 3.a, 4, 7.d
2000	F(adult) = 0.2, F(juv) < 0.1	265 000	265 000	36 000	284 000	346 000	388 000
2001	F(adult) = 0.2, F(juv) < 0.1	See scenarios	265 000	36 000	296 000	323 000	363 000
2002	F(adult) = 0.2, F(juv) < 0.1	See scenarios	265 000	36 000	304 000	353 000	372 000
2003	F(adult) = 0.25, F(juv) = 0.12	See scenarios	400 000	52 000	414 000	450 000	48 0000
2004	F(adult) = 0.25, F(juv) = 0.1	See scenarios	460 000	38 000	484 000	550 000	567 000
2005	F(adult) = 0.25, F(juv) = 0.1	See scenarios	535 000	50 000	568 000	639 000	664 000
2006	F(adult) = 0.25, F(juv) = 0.12	See scenarios	455 000	43 000	490 000	511 000	515 000
2007	Bring SSB above B_{pa} by 2008	See scenarios	341 000	32 000	361 000	388 000	407 000
2008	F(adult) = 0.17, F(juv) = 0.08 (management plan [MP])	See scenarios	201 000	19 000	228 000	245 000	258 000
2009	Adopt one of the new proposed HCRs	See scenarios	171 000	16 000	167 000	166 000	168 000
2010	F(adult) = 0.15, F(juv) = 0.05 (MP)	See scenarios	164 000	14 000	175 000	175 000	188 000
2011	See scenarios	See scenarios	200 000	16 000	218 000	218 000	226 000
2012	2008 management plan	See scenarios	405 000	18 000	425 000	425 000	435 000
2013	2008 management plan	See scenarios	478 000	14 000	498 000	498 000	511 000
2014	2008 management plan	See scenarios	470 000	13 000	504 000	508 000	517 000
2015	2008 management plan	See scenarios	445 000	16 000	480 000	482 000	494 000
2016	2014 management strategy	555 086	518 000	13 000	559 700	559 900	563 600
2017	2014 management strategy	458 926	481 608	11 375	491 693	491 693	498 662
2018	2014 management strategy	517 891	600 588	9 669	602 328	602 328	603 536
2019	ICES MSY approach	311 572	385 008	13 190	444 001	445 631	442 886
2020	ICES MSY approach	431 062	385 008	8 954	424 799	427 321	426 928
2021	ICES MSY approach	365 792	356 357	7 750	364 453	364 616	365 351
2022	ICES MSY approach	532 183	427 628	8 174	465 957	467 134	462 246
2023	ICES MSY approach	414 886	396 556	7 716			
2024	ICES MSY approach	532 166					

* Catch in directed fishery in Subarea 4 and Division 7.d (A-fleet).
** Revision of advice given in 1995.
*** Revised in June 1996, down from 263 000 tonnes.
# Landings are provided by ICES and do not in all cases correspond to official statistics.
ICES catch includes unallocated and misreported landings, discards, and slipping. Includes catches for WBSS in the North Sea.
Bycatch ceiling up to 2012 and TAC from 2013.

History of the catch and landings

Table 8 Herring in Subarea 4 and divisions 3.a and 7.d, autumn spawners. Catch distribution by fleet and area in 2021 as estimated by ICES.

Area where NSAS are caught	Fleet	Fishery	NSAS 2022 catches (tonnes)
North Sea fisheries (Subarea 4, Division 7.d)	A	Directed herring fisheries	455 604
	B	Bycatches of herring	6 127
Division 3.a	C	Directed herring fisheries	296
	D	Bycatches of herring	219

Table 9 Herring in Subarea 4 and divisions 3.a and 7.d, autumn spawners. Catch distribution in 2022 as estimated by ICES.

Catch (2022)	Landings		Discards
462 246 tonnes	Directed fishery 98.6%	Bycatch 1.4%	Negligible (< 1%)
	462 246 tonnes		

Table 10 Herring in Subarea 4 and divisions 3.a and 7.d, autumn spawners. History of commercial catch and landings of all stocks of herring caught in the North Sea; official or ICES estimated values are presented by area for each country participating in the fishery. All weights are in tonnes. These figures do not in all cases correspond to the official statistics and cannot be used for legal purposes.

Country	2005	2006	2007	2008	2009	2010	2011
Belgium	6	3	1	-	-	-	4
Denmark*	128 380	102 322	84 697	62 864	46 238	45 869	58 726
Faroe Islands	738	1 785	2 891	2 014	1 803	3 014	-
France	38 829	49 475	24 909	30 347	18 114	17 745	16 693
Germany	46 555	40 414	14 893	8095	5368	7 670	9 427
Netherlands	81 531	76 315	66 393	23 122	24 552	23 872	34 708
Norway	156 802	135 361	100 050	59 321	50 445	46 816	60 705
Poland	458	-	-	-	-	90	-
Sweden	13 464	10 529	15 448	13 840	5299	4 395	8 086
USSR/Russian Federation	99	-	-	-	-	-	-
UK (England)	25 311	22 198	15 993	11 717	652	10 770	11 468
UK (Scotland)	73 227	48 428	35 115	16 021	14 006	14 373	18 564
UK (N. Ireland)	2 912	3 531	638	331	-	-	17
Unallocated landings	57 788	18 764	26 641	17 151	−726	-	-
Total landings	626 101	509 125	387 669	244 823	165 751	174 614	218 398
Discards	12 824	1492	93	224	91	13	-
Total catch	638 925	510 617	387 762	245 047	165 842	174 627	218 398
Parts of the catches that have been allocated to spring-spawning stocks							
WBSS	7039	10 954	1070	124	3941	774	308
Thames Estuary**	74	65	2	7	48	85	2
Norw. spring spawners***	417	626	685	2721	44 560	56 900	12 178

Country	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Belgium	3	14	27	18	26	13	32	60	119	47	52
Denmark*	105 707	117 367	124 423	113 481	133 962	110 318	132 231	91 680	95 615	62 943	76 168
Faroe Islands	-	-	118	981	833	442	497	614	804	0	212
France	23 819	30 122	29 679	30 269	35 177	28 801	31 505	25 288	19 768	25 070	28 573
Germany	24 515	46 922	36 767	44 377	44 231	43 707	51 636	37 699	29 439	25 741	46 986
Netherlands	72 344	80 462	74 647	70 076	98 859	84 914	111 302	79 465	75 036	66 402	74 376
Norway	119 253	143 718	142 002	134 349	150 183	134 132	162 594	128 614	115 879	95 061	133 998
Lithuania	-	-	9 830	-	-	-	-	-	-	466	-
Sweden*	14 092	15 615	15 583	13 184	16 625	18 518	19 408	13 184	13 149	18 765	19 813
Ireland	-	221	68	183	127	868	515	3	235	414	306
UK (England)	25 346	19 079	19 287	18 897	20 485	16 997	19 591	12 685	16 241	13 174	15 590
UK (Scotland)	34 414	39 243	45 119	48 332	59 240	49 514	66 005	50 771	49 692	51 194	63 756
UK (N. Ireland)	4 794	5 738	6 612	5 948	-	3 469	6 916	3 938	2 681	5 176	3 866
Unallocated landings	321	-	3 292	1 516	8	0	0	0	0	0	0
Total landings	424 608	498 501	507 454	481 611	559 756	491 693	602 232	444 001	424 800	364 453	463 696
Discards/BMS	-	-	31	-	170	-	96	1 630	2 522	162	3 438
Total catch	424 608	498 501	507 485	481 611	559 926	491 693	602 328	445 631	427 321	364 615	467 134
Parts of the catches that have been allocated to spring-spawning stocks											
WBSS	2 095	452	2 953	2 205	1 839	632	2 164	8 832	6 802	3 505	5 402
Thames Estuary **	63	20	10	10	1	0	10	-	-	2	0
Norw. spring spawners ***	9 619	3 150	2 307	2 191	216	83	310	5	88	0	0

* Including any bycatches in the industrial fishery.

** Landings from the Thames Estuary area are included in the North Sea catch figure for UK (England).

*** These catches (including some local fjord-type spring spawners) are taken by Norway under a separate quota south of 62°N and are not included in the Norwegian North Sea catch figure for this area.

Table 11 Herring in Subarea 4 and divisions 3.a and 7.d, autumn spawners. The "Wonderful Table", which shows herring TACs and catches by different fleets, areas, and stocks. Weights are in thousand tonnes.

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Subarea 4 and Division 7.d: TAC																
Agreed divisions 4.a–b	303.5	174.6	147.4	149	173.5	360.4	427.7	418.3	396.3	461.2	428.7	534.5	342.7	342.7	321.6	380.6
Agreed divisions 4.c, 7.d	37.5	26.7	23.6	15.3	26.5	44.6	50.3	51.7	49	57	53	66	42.4	42.4	34.8	47.0
Bycatch ceiling in the small-mesh fishery*	31.9	18.8	16	13.6	16.5	17.9	14.4	13.1	15.7	13.4	11.4	9.7	13.2	9.0	7.8	8.2
CATCH (Subarea 4 and Division 7.d)																
National catch divisions 4.a–b**	326.8	201.2	145	148.1	191.7	387.2	453.8	465.9	439	514	456.5	556.9	405.1	389.3	328.5	424.4
Unallocated catch divisions 4.a–b	21.9	14	−1.1	0	0	−3.0	0	3.3	1.5	0	0	0	0.0	0.0	0.0	0.0
Discard/slipping divisions 4.a–b***	0.1	0.2	0.1	0	-	-	-	0	-	0.1	-	0	0.8	0.3	0.1	1.2
Total catch divisions 4.a–b#	348.8	215.4	143.9	148.1	191.7	384.2	453.9	469.2	440.5	514.1	456.5	556.9	405.9	389.6	328.5	425.6
National catch divisions 4.c, 7.d**	34.3	26.5	21.5	26.5	26.7	37.1	44.7	38.2	41.1	45.8	35.2	45.4	38.9	35.5	36.0	39.3
Unallocated catch divisions 4.c, 7.d	4.7	3.1	0.4	0	0	3.3	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Discard/slipping divisions 4.c, 7.d***	-	-	-	-	-	-	-	-	-	0.1	-	0.1	0.8	2.2	0.1	2.3
Total catch divisions 4.c, 7.d	39	29.6	21.9	26.5	26.7	40.4	44.7	38.2	41.1	45.8	35.2	45.5	39.8	37.7	36.1	41.5
Total catch Subarea 4 and Division 7.d as used by ICES#	387.8	245	165.8	174.6	218.4	424.6	498.5	507.5	481.6	559.9	491.7	602.3	445.6	427.3	364.6	467.1
CATCH BY FLEET/STOCK (Subarea 4 and Division 7.d) ##																
North Sea autumn spawners directed fisheries (A-fleet)	379.6	236.3	152.1	164.8	209.2	411.8	489.9	490.5	471.5	543.6	484.1	591.7	440.5	417.5	352.3	455.6
North Sea autumn spawners industrial (B-fleet)	7.1	8.6	9.8	9.1	8.9	10.6	8.1	14	7.9	14.5	7	8.5	5.2	9.9	8.8	6.1
North Sea autumn spawners in Subarea 4 and Division 7.d total	386.7	244.9	161.9	173.9	218.1	422.5	498.1	504.5	479.4	558.1	491.1	600.2	436.8	420.5	361.1	461.7

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Baltic-20–24-type spring spawners in Subarea 4	1.1	0.1	3.9	0.8	0.3	2.1	0.5	3	2.2	1.8	0.6	2.2	8.8	6.8	3.5	5.4
Coastal-type spring spawners	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Norw. spring spawners caught under a separate quota in Subarea 4[###]	0.7	2.7	44.6	56.9	12.2	9.6	3.2	2.3	2.2		0.1	0.3	0.0	0.1	0.0	0.0
Division 3.a: TAC																
Agreed herring TAC	69.4	51.7	37.7	33.9	30	45	55	46.8	43.6	51.1	50.7	48.4	29.3	24.5	21.6	25.0
Bycatch ceiling in the small-mesh fishery	15.4	11.5	8.4	7.5	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7
CATCH (Division 3.a)																
National catch	47.3	38.2	38.8	37.3	20	27.7	31.2	28.9	27.8	29.9	26.8	23.3	14.9	17.8	13.3	0.7
Catch as used by ICES	47.4	38.2	38.8	37.3	20	27.7	31.2	28.9	27.8	29.9	26.8	23.3	14.9	17.8	13.3	0.7
CATCH BY FLEET/STOCK (Division 3.a)[##]																
Autumn spawners human consumption (C-fleet)	16.4	9.2	5.1	12	6.6	7.8	11.8	9.5	10.2	4.1	7.4	3.2	5.8	6.0	4.1	0.3
Autumn spawners mixed clupeoid (D-fleet)	3.4	3.7	1.5	1.8	1.8	4.4	1.6	3.3	4.4	1.4	0.2	0.2	0.3	0.4	0.1	0.2
Autumn spawners in Division 3.a total	19.8	12.9	6.5	13.8	8.4	12.2	13.4	12.8	14.7	5.5	7.6	3.4	6.1	6.4	4.2	0.5
Spring spawners human consumption (C-fleet)	25.3	23	29.4	23	10.8	14.5	16.6	15.4	11.3	23.3	19	19.7	8.8	10.9	9.0	0.2
Spring spawners mixed clupeoid (D-fleet)	2.3	2.2	2.9	0.5	0.8	1	1.3	0.6	1.8	1.1	0.2	0.2	0.0	0.5	0.0	0.0
Spring spawners in Division 3.a total	27.6	25.2	32.3	23.5	11.6	15.5	17.9	16.1	13.1	24.4	19.2	19.9	8.8	11.4	9.1	0.2
North Sea autumn spawners: Total as used by ICES	406.5	257.9	168.4	187.6	226.5	434.6	511.4	517.3	494.1	563.6	498.7	603.5	442.9	426.9	365.4	462.2

[*] Divisions 4.a–b and EU zone of Division 2.a until 2021. From 2021 onwards, UK zone of Division 2.a.

[**] ICES estimates.

*** Incomplete; only some countries providing discard information.

[#] Includes spring spawners not included in assessment.

[##] Based on sum-of-products (number × mean weight-at-age).

[###] These catches (including local fjord-type spring spawners) are taken by Norway under a separate quota south of 62°N and are not included in the Norwegian North Sea catch figure.

Summary of the assessment

Table 12 Herring in Subarea 4 and divisions 3.a and 7.d, autumn spawners. Assessment summary. Weights are in tonnes and numbers in thousands. High and Low refer to the 95% confidence intervals.

Year	Recruitment			SSB			Total Catch	F		
	Recruitment at age (wr) 0	High	Low	SSB *	High	Low		Ages 2-6	High	Low
	thousands			tonnes			tonnes			
1947	34843100	61859100	19625900	5288144	7345197	3807178	581760	0.128	0.182	0.089
1948	33204200	55854700	19739100	4492545	6184496	3263477	502100	0.116	0.163	0.082
1949	27923600	46479300	16775800	4064846	5532224	2986678	508500	0.140	0.195	0.101
1950	39551300	64569600	24226600	3813382	5089575	2857190	491700	0.148	0.20	0.109
1951	38374300	62139800	23697900	3377236	4451638	2562141	600400	0.198	0.26	0.150
1952	38187400	61387400	23755300	3195395	4179780	2442845	664400	0.22	0.29	0.167
1953	43252100	67452700	27734100	2963000	3868730	2269315	698500	0.23	0.31	0.178
1954	40358200	62713100	25972100	2706632	3556076	2060095	762900	0.28	0.37	0.21
1955	34301200	52976500	22209400	2714584	3548780	2076479	806400	0.25	0.33	0.192
1956	25467600	39365000	16476600	2625637	3425382	2012614	675200	0.25	0.33	0.191
1957	57469600	89611400	36856400	2376964	3101434	1821725	682900	0.27	0.35	0.21
1958	24929500	38198800	16269600	2018983	2632028	1548726	670500	0.25	0.32	0.192
1959	28331700	44585200	18003400	2919711	3778696	2255993	784500	0.30	0.39	0.23
1960	12552200	19584500	8045020	2516069	3247306	1949494	696200	0.25	0.32	0.191
1961	52690600	81895000	33900800	2536810	3227610	1993861	696700	0.27	0.35	0.22
1962	28485200	43369800	18709000	1771243	2282924	1374247	627800	0.32	0.40	0.25
1963	34232700	51819300	22614600	2789711	3483637	2234012	716000	0.188	0.23	0.152
1964	34357600	51697500	22833700	2516773	3042632	2081799	871200	0.29	0.35	0.24
1965	17213800	25915900	11433700	1991409	2365029	1676813	1168800	0.53	0.63	0.45
1966	18496100	27664300	12366300	1594303	1877911	1353527	895500	0.49	0.58	0.42
1967	25581800	38468700	17012000	958349	1116021	822953	695500	0.69	0.79	0.60
1968	21939600	32710100	14715500	523395	611144	448244	717800	1.08	1.23	0.96
1969	12755400	19275800	8440620	479343	583718	393632	546700	0.88	1.01	0.77
1970	21817700	32962200	14441200	454924	554358	373326	563100	0.96	1.09	0.85
1971	17158500	25637500	11483700	286581	346824	236803	520100	1.42	1.60	1.26
1972	12615800	18982100	8384610	329390	398946	271962	497500	0.62	0.72	0.54
1973	6893960	10343900	4594670	278827	333804	232904	484000	0.95	1.08	0.83
1974	10772600	16438300	7059740	191402	227786	160829	275100	0.90	1.03	0.79
1975	2573250	3956820	1673470	105746	127846	87467	312800	1.19	1.38	1.03
1976	3337080	5294180	2103460	144849	190856	109932	174800	0.88	1.12	0.69
1977	4403790	7150660	2712100	110114	151426	80073	46000	0.33	0.45	0.24
1978	4327910	7102320	2637280	137100	186960	100537	11000	0.23	0.36	0.143
1979	7877580	12474400	4974700	187117	244149	143407	25100	0.187	0.30	0.116

Year	Recruitment			SSB			Total Catch	F		
	Recruitment at age (wr) 0	High	Low	SSB *	High	Low		Ages 2-6	High	Low
	thousands			tonnes			tonnes			
1980	12639900	18879100	8462660	210879	264376	168208	70764	0.166	0.21	0.132
1981	27375300	40711700	18407700	271738	339455	217530	174879	0.25	0.31	0.199
1982	46445100	68929700	31294800	385735	475737	312760	275079	0.191	0.24	0.155
1983	46151100	66929100	31823600	550510	673682	449858	387202	0.27	0.33	0.22
1984	46549400	67343200	32176200	906030	1109331	739986	428631	0.35	0.42	0.29
1985	55251300	80121600	38100900	994586	1205293	820715	613780	0.45	0.54	0.38
1986	67358000	98038300	46278800	1035062	1246921	859198	671488	0.42	0.50	0.35
1987	57782200	83957100	39767700	1217539	1465019	1011865	792058	0.39	0.47	0.33
1988	38074900	55195400	26264800	1559333	1869845	1300386	887686	0.38	0.45	0.32
1989	29846600	43252900	20595600	1620487	1892439	1387617	787899	0.37	0.43	0.31
1990	27756800	40347700	19095100	1773102	2065162	1522345	645229	0.29	0.34	0.24
1991	30285400	43959400	20864800	1574572	1826371	1357488	658008	0.31	0.36	0.26
1992	52786700	73761300	37776400	1198109	1394357	1029482	716799	0.37	0.43	0.31
1993	55579800	78042400	39582600	853988	1004601	725955	671397	0.43	0.51	0.36
1994	43072900	60711300	30559000	910441	1072792	772659	568234	0.43	0.51	0.36
1995	44203700	62465600	31280700	942466	1119219	793627	579371	0.40	0.47	0.33
1996	35958400	50706800	25499700	1103450	1308028	930869	275098	0.194	0.23	0.162
1997	29160300	41213300	20632300	1272213	1500463	1078684	264313	0.184	0.22	0.153
1998	19186600	26677000	13799300	1459599	1706568	1248371	391628	0.22	0.27	0.185
1999	55290400	76858400	39774800	1554935	1817635	1330202	363163	0.20	0.24	0.170
2000	40457200	55907100	29276900	1586086	1851416	1358781	388157	0.21	0.25	0.177
2001	67636300	94650200	48332500	1971508	2299118	1690581	374065	0.178	0.21	0.149
2002	36318500	50445000	26148000	2444638	2853546	2094326	394709	0.166	0.198	0.139
2003	20507500	28386900	14815200	2401843	2785119	2071311	482281	0.192	0.23	0.162
2004	23686000	32806700	17100900	2369684	2742004	2047918	587698	0.24	0.29	0.20
2005	20842300	28705900	15132800	2142889	2493183	1841812	663813	0.29	0.34	0.24
2006	21487000	29682100	15554600	1749434	2032169	1506036	514597	0.25	0.29	0.21
2007	24668100	34301700	17740100	1390565	1620605	1193178	406482	0.22	0.27	0.188
2008	22373000	31174100	16056700	1481491	1724983	1272369	257870	0.135	0.161	0.113
2009	35013300	48725400	25160000	1830015	2134421	1569023	168443	0.071	0.085	0.059
2010	28340600	39314800	20429800	1942330	2269943	1662001	187611	0.077	0.092	0.064
2011	24999200	34559600	18083500	2283300	2635688	1978027	226478	0.099	0.118	0.084
2012	23320000	32291200	16841100	2341959	2701449	2030307	434710	0.180	0.21	0.152
2013	31738700	44182500	22799700	2139312	2464198	1857260	511416	0.21	0.25	0.180
2014	47612900	66697000	33989300	2112189	2435929	1831475	517356	0.21	0.24	0.173
2015	13682000	19140100	9780370	1972826	2280178	1706903	494099	0.21	0.25	0.177
2016	23844100	33030600	17212500	2271820	2640873	1954341	563610	0.23	0.27	0.193

Year	Recruitment			SSB			Total Catch	F		
	Recruitment at age (wr) 0	High	Low	SSB *	High	Low		Ages 2-6	High	Low
	thousands			tonnes			tonnes			
2017	14401300	20056400	10340800	2108214	2462588	1804837	498437	0.191	0.23	0.161
2018	24778600	34356700	17870700	1892368	2214143	1617355	603536	0.22	0.26	0.183
2019	22146700	30751500	15949700	1632336	1904082	1399372	442138	0.185	0.22	0.155
2020	25562900	35497400	18408700	1568755	1828082	1346214	426900	0.189	0.22	0.159
2021	18159400	25973100	12696300	1476805	1728184	1261992	365356	0.185	0.22	0.155
2022	31135000	46773500	20725200	1652003	1978627	1379296	462247	0.23	0.28	0.186
2023	31349400	58743100	16730200	1480607^						

* At spawning time (September).

^ The predicted 2023 SSB from the intermediate forecast, applying an exact biomass removed by each fleet (see tables 2 and 3).

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