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Document de référénce 2011/03 - Erratum

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Reference Document 2011/03 - Erratum

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Erratum

Assessment of Eastern Georges Bank Haddock for 2011

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Canada

Erratum:

This erratum pertains to corrections required due to incorrect beginning of year population weights at ages 2, 3 and 4 for the 2010 year class which were used for projections and resulted in wrong population biomass estimates for years following 2011. Corrections to text, *original* versus corrected, in the ABSTRACT, OUTLOOK and SPECIAL CONSIDERATIONS sections and corrections to tables 30, 31, 32 and 33 are indicated below in **underlined bold red** font:

Erratum :

Le présent erratum porte sur les corrections requises en raison d'une mauvaise détermination des poids de la population au début de l'année, aux âges 2, 3 et 4 pour la classe d'âge de 2010, lesquels ont été utilisés pour effectuer des projections et ont alors donné lieu à des estimations de la biomasse de la population erronées pour les années après 2011. Les corrections apportées au texte (la *version originale* par rapport à la version corrigée) dans les sections SOMMAIRE, PERSPECTIVES et CONSIDÉRATIONS PARTICULIÈRES et les corrections apportées aux tableaux 30, 31, 32 et 33 sont indiquées ci-dessous, en **caractères gras et soulignées en rouge** :

ABSTRACT

Page i, last line of abstract, original: *"Adult biomass is projected to increase to **124,600** mt at the beginning of 2013."*

Page i, last line of abstract, corrected: "Adult biomass is projected to increase to **188,700** mt at the beginning of 2013."

SOMMAIRE

Page i, dernière ligne du sommaire, version originale : *« On prévoit que la biomasse des adultes sera de **124 600 tm** au début de 2013. »*

Page i, dernière ligne du sommaire, version corrigée : « On prévoit que la biomasse des adultes sera de **188 700 tm** au début de 2013. »

OUTLOOK

Page 12, 2nd paragraph, original: *"A deterministic projection… The adult biomass will decline to 64,900 mt at the beginning of 2012 as is expected with the passing of the 2003 year class through the population but it will increase to **124,600** mt at the beginning of 2013 when the 2010 year class will be age 3. The 9+ group, of which the 2003 year class is the main component, is expected to comprise 72% and the 2005 year class 11% of the 2012 catch biomass (Table 31)."*

Page 12, 2nd paragraph, corrected: "A deterministic projection… The adult biomass will decline to 64,900 mt at the beginning of 2012 as is expected with the passing of the 2003 year class through the population but it will increase to **188,700** mt at the beginning of 2013 when the 2010 year class will be age 3. The 9+ group, of which the 2003 year class is the main component, is expected to comprise 72% and the 2005 year class 11% of the 2012 catch biomass (Table 31)."

Page 12, 4th paragraph, original: "*An exploratory projection analysis with constant catch of 22, 20, 18, 16 and 14 thousand mt for 2012 and 2013 indicated that the adult biomass would be expected to increase in 2013 and 2014 compared to the current level (2011), however, the fishing mortality rate would exceed Fref for the higher catch levels (Table 32). The sensitivity of the projections to the size of the 2010 year class was examined by reducing it to half of its estimated size. **Biomass then decreased** from the 2011 level for all constant catch levels examined **and** the fishing mortality was higher and usually greater than Fref (Table 33). If the lower partial recruitment for the 9+ age group that the model estimates is aliasing higher natural mortality, emigration of older ages outside the management area or some unknown mechanism which results in the unavailability of older*

ages to the fishery, Fs would be higher as more of the catch would come from the younger ages.

Page 12, 4th paragraph, corrected: "An exploratory projection analysis with constant catch of 22, 20, 18, 16 and 14 thousand mt for 2012 and 2013 indicated that the adult biomass would be expected to increase in 2013 and 2014 compared to the current level (2011), however, the fishing mortality rate would exceed Fref for the higher catch levels (Table 32). The sensitivity of the projections to the size of the 2010 year class was examined by reducing it to half of its estimated size. **Biomass still increased** from the 2011 level for all constant catch levels examined **but** the fishing mortality was higher and usually greater than F_{ref} (Table 33). If the lower partial recruitment for the 9+ age group that the model estimates is aliasing higher natural mortality, emigration of older ages outside the management area or some unknown mechanism which results in the unavailability of older ages to the fishery, Fs would be higher as more of the catch would come from the younger ages."

SPECIAL CONSIDERATIONS

Page 13, 2nd paragraph, original: *"The medium term outlook for stock biomass is strongly influenced by the outstanding 2003 and 2010 year classes. As the importance of the 2003 year class diminishes, the 3+ stock biomass will decline in 2012 even for relatively low catch, and it will then increase beginning in 2013 as the 2010 year class recruits. While the catch projection indicates that the 2012 TAC should be less than the 2011 TAC to prevent the fishing mortality rate from exceeding the Fref, the adult biomass would be expected to increase in 2013 and 2014 compared to the current level (2011), even if the 2010 TAC of 22,000 mt was maintained. **However, if** the 2010 year class turns out to be much smaller than currently estimated (i.e., half the size), a catch equal to the current TAC **is likely to result in a decrease in adult biomass in 2014 compared to 2011.**"*

Page 13, 2nd paragraph, corrected: "The medium term outlook for stock biomass is strongly influenced by the outstanding 2003 and 2010 year classes. As the importance of the 2003 year class diminishes, the 3+ stock biomass will decline in 2012 even for relatively low catch, and it will then increase beginning in 2013 as the 2010 year class recruits. While the catch projection indicates that the 2012 TAC should be less than the 2011 TAC to prevent the fishing mortality rate from exceeding the F_{ref}, the adult biomass would be expected to increase in 2013 and 2014 compared to the current level (2011), even if the 2010 TAC of 22,000 mt was maintained. **If** the 2010 year class turns out to be much smaller than currently estimated (i.e., half the size), a catch equal to the current TAC **would still result in an increase in adult biomass in 2013 and 2014 compared to 2011**."

Following are corrections to table contents:

Page 48, Table 30. The weights at the beginning of the year for the population for the 2010 year class at ages 2, 3 and 4 were incorrect. Corrected values are indicated in **underlined bold red** font in the revised Table 30 below.

Page 49, Table 31. The population biomass for the 2010 year class at ages 2, 3 and 4 and the 1+ and 2+ biomass in 2012 and the 1+, 2+ and 3+ biomass in 2013 and 2014 were

incorrect. Corrected values are indicated in **underlined bold red** font in the revised Table 31 below.

Page 50, Table 32 and 33. The population biomass for the 2010 year class at ages 2, 3 and 4 and the 1+ and 2+ biomass in 2012 and the 1+, 2+ and 3+ biomass in 2013 and 2014 were incorrect. Corrected values are indicated in **underlined bold red** font in the revised Table 31 below.

Table 30. Input for projections and risk analyses of eastern Georges Bank haddock for the 2011 fishery. A catch of 22,000 mt in 2011 and natural mortality = 0.2 were assumed for the forecasts. Shaded values indicate the 2003 (yellow), 2005 (grey) and the 2010 (blue) year classes for which year class specific growth patterns were used to determine input values.

Year	Age Group								
	1	2	3	4	5	6	7	8	9+
Population Numbers (000s)									
2011	557140	4766	3365	4923	2444	7170	1034	47284	6570
Partial Recruitment to the Fishery[1]									
2011	0.004[2]	0.06	0.3	0.5	1	1	1	1	1
2012	0.01	0.004[2]	0.3	0.5	1	1	1	1	1
2013	0.01	0.06	0.051[2]	0.5	1	1	1	1	1
Weight at beginning of year for population (kg)[3]									
2011	0.04	0.32	0.61	0.9	0.95	1.02	1.120	1.37	1.721
2012	0.04	**0.22**[2]	0.61	0.9	0.95	1.02	1.48[4]	1.37	1.37[5]
2013	0.04	0.32	**0.39**[2]	0.9	0.95	1.02	1.31[6]	1.64[4]	1.37[5]
2014	0.04	0.32	0.61	**0.71**[2]	0.95	1.02	1.31[6]	1.37	1.37[5]
Weight at age for catch (kg)[7]									
2011	0.39[2]	0.74	1.06	1.23	1.34	1.63[8]	1.64[9]	1.6	2.3[10]
2012	0.44	0.63[2]	1.06	1.23	1.34	1.5	1.78[8]	1.96[11]	1.6[5]
2013	0.44	0.74	0.98[2]	1.23	1.34	1.5	1.64[9]	1.96[11]	1.6[5]
Maturity									
2011	0	0	1	1	1	1	1	1	1
2012	0	0	1	1	1	1	1	1	1
2013	0	0	1	1	1	1	1	1	1

[1]Based on 2006 to 2010 average except where indicated and ages 5 to 9+ assumed fully recruited.
[2]Based on observed values from 2003 year class.
[3]2011 Canadian Department of Fisheries and Oceans (DFO) survey average weights at age except where indicated.
[4]Based on a length based growth model (see Table 30). Lengths were converted to weights using a length-weight relationship for commercially caught fish (Waiwood and Nielson 1985) and reduced by 15% to reflect lower population weights at age (Table 30).
[5]The 9+ group weights are based on the 2003 year class. No growth was assumed for the 2003 year class (in the 9+ group at age 9, 10 and 11).
[6]Based on the 2009 to 2011 age 7 survey average as the 2011 DFO survey value indicated a reduction in weight at age from age 6 to age 7 within the year class (Table 19).
[7]2010 Canadian fishery weights at age except where indicated.
[8]Based on a length based growth model. Lengths were converted to weights using a length-weight relationship for commercially caught fish (Waiwood and Nielson 1985) (Table 30).
[9]Average of 2008 to 2010 Canadian fishery weights at age (rather than using the 2003 year class weight at age 7 which is growing more slowly than other year classes).
[10]Average of 2008 to 2010 Canadian fishery weights at age.
[11]Average of 2008 to 2010 Canadian fishery weights at age instead of the 2010 age 8 weight which was a drop in weight from age 7 for this year class .

Table 31. Bias adjusted deterministic projection results for eastern Georges Bank haddock for the 2012 and 2013 fishery using 10 million age 1 recruits for the 2011 year class and 6.3 million age 1 recruits (the 2002 to 20011 median) for the 2012 and 2013 year classes and assuming that the 2011 quota of 22,000 mt is caught. Shaded values indicate the 2003 (yellow), 2005 (grey) and the 2010 (blue) year classes.

Year	Age Group											
	1	2	3	4	5	6	7	8	9+	1+	2+	3+
Population Numbers (000s)												
2011	557,140	4,766	3,365	4,923	2,444	7,170	1,034	47,284	6,570	634,696	77,556	72,790
2012	10,000	455,709	3,846	2,563	3,573	1,573	4,614	665	34,658	517,201	507,201	51,492
2013	6,300	8,166	372,715	2,913	1,843	2,256	993	2,913	22,299	420,398	414,098	405,932
2014	6,300	5,145	6,582	301,134	2,094	1,163	1,424	627	15,916	340,385	334,085	328,940
Population Biomass (mt)												
2011	21,171	1,535	2,059	4,430	2,329	7,299	1,158	64,826	11,307	116,115	94,944	93,409
2012	400	**100,256**	2,346	2,307	3,395	1,604	6,829	911	47,481	**165,530**	**165,130**	64,874
2013	252	2,613	**145,359**	2,621	1,750	2,301	1,301	4,777	30,550	**191,524**	**191,272**	**188,659**
2014	252	1,646	4,015	**213,805**	1,989	1,186	1,865	859	21,805	**247,423**	**247,171**	**245,525**
Fishing mortality												
2011	0.001	0.014	0.072	0.12	0.241	0.241	0.241	0.241	0.241			
2012	0.003	0.001	0.078	0.13	0.26	0.26	0.26	0.26	0.26			
2013	0.003	0.016	0.013	0.13	0.26	0.26	0.26	0.26	0.26			
Projected Catch Numbers (000s)												
2011	486	62	213	507	476	1,396	201	9,206	1,279	13,826	13,340	13,278
2012	24	429	262	284	745	328	962	139	7,223	10,396	10,372	9,943
2013	15	115	4,451	323	384	470	207	607	4,647	11,219	11,204	11,089
Catch Biomass (mt)												
2011	190	46	226	624	638	2,276	330	14,730	2,942	22,000	21,810	21,765
2012	10	301	278	349	998	492	1,712	272	11,557	15,967	15,957	15,656
2013	7	85	4,362	397	515	705	339	1,190	7,436	15,034	15,028	14,943

Table 32. Bias adjusted deterministic projection results for eastern Georges Bank haddock to beginning of year 2014 for constant quota scenarios of 22, 20, 18, 16 and 14 thousand mt for 2012 and 2013. Partial recruitment to the fishery for the 9+ group was set at 1. F is for fully recruited ages. Highlighted cells (yellow and green) indicate the 2010 year class at ages 1 to 4 and the 2003 year class at age 8 and in the 9+ group. Highlighted F values indicate values greater than the F_{ref}. Biomass at the beginning of 2014 is highlighted to facilitate comparison between scenarios.

				Age Group										
Quota	**Year**	**F**		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9+**	**1+**	**3+**
22 K	2011		Biomass	21,171	1,535	2,059	4,430	2,329	7,299	1,158	64,826	11,307	116,115	93,409
	2012			400	100,256	2,346	2,307	3,395	1,604	6,829	911	47,481	165,529	64,874
	2013			206	2,610	145,291	2,531	1,651	2,047	1,157	4,250	27,175	186,918	184,101
	2014			206	1,346	3,969	211,823	1,761	941	1,395	642	16,308	238,391	236,839
	2011	0.241	Catch	190	46	226	624	638	2,276	330	14,730	2,942	22,000	21,765
	2012	0.377		15	436	396	492	1,372	676	2,353	374	15,887	22,000	21,549
	2013	0.433		9	140	7,237	613	748	966	465	1,631	10,190	22,000	21,851
20K	2011		Biomass	21,171	1,535	2,059	4,430	2,329	7,299	1,158	64,826	11,307	116,115	93,409
	2012			400	100,256	2,346	2,307	3,395	1,604	6,829	911	47,481	165,529	64,874
	2013			206	2,611	145,314	2,562	1,684	2,131	1,205	4,424	28,290	188,428	185,611
	2014			206	1,346	3,984	212,460	1,833	1,015	1,536	707	17,951	241,038	239,485
	2011	0.241	Catch	190	46	226	624	638	2,276	330	14,730	2,942	22,000	21,765
	2012	0.337		13	389	356	444	1,248	615	2,141	340	14,454	20,000	19,597
	2013	0.378		8	123	6,315	548	682	899	433	1,517	9,477	20,000	19,870
18K	2011		Biomass	21,171	1,535	2,059	4,430	2,329	7,299	1,158	64,826	11,307	116,115	93,409
	2012			400	100,256	2,346	2,307	3,395	1,604	6,829	911	47,481	165,529	64,874
	2013			206	2,612	145,337	2,592	1,717	2,215	1,252	4,599	29,409	189,938	187,120
	2014			206	1,347	3,998	213,053	1,903	1,090	1,681	774	19,647	243,698	242,145
	2011	0.241	Catch	190	46	226	624	638	2,276	330	14,730	2,942	22,000	21,765
	2012	0.298		12	345	317	397	1,124	554	1,928	306	13,018	18,000	17,644
	2013	0.326		7	106	5461	484	614	826	398	1,394	8,710	18,000	17,887
16K	2011		Biomass	21,171	1,535	2,059	4,430	2,329	7,299	1,158	64,826	11,307	116,115	93,409
	2012			400	100,256	2,346	2,307	3,395	1,604	6,829	911	47,481	165,529	64,874
	2013			206	2,613	145,358	2,621	1,750	2,299	1,300	4,774	30,531	191,452	188,632
	2014			206	1,348	4,011	213,603	1,971	1,164	1,830	843	21,392	246,368	244,814
	2011	0.241	Catch	190	46	226	624	638	2,276	330	14,730	2,942	22,000	21,765
	2012	0.261		10	301	278	350	1,000	493	1,715	272	11,580	16,000	15,688
	2013	0.279		6	91	4,670	423	546	748	360	1,263	7,892	16,000	15,903
14K	2011		Biomass	21,171	1,535	2,059	4,430	2,329	7,299	1,158	64,826	11,307	116,115	93,409
	2012			400	100,256	2,346	2,307	3,395	1,604	6,829	911	47,481	165,529	64,874
	2013			206	2,614	145,380	2,650	1,782	2,384	1,348	4,950	31,657	192,971	190,151
	2014			206	1,348	4,023	214,115	2,037	1,239	1,983	913	23,181	249,044	247,490
	2011	0.241	Catch	190	46	226	624	638	2,276	330	14,730	2,942	22,000	21,765
	2012	0.224		9	259	241	304	876	431	1,502	238	10,140	14,000	13,732
	2013	0.234		5	77	3,935	364	478	667	321	1,125	7,029	14,000	13,919

Table 34. Bias adjusted deterministic projection results for eastern Georges Bank haddock to beginning of year 2014 for constant quota scenarios of 22, 20, 18, 16 and 14 thousand mt. The 2010 year class was reduced to half of its estimated size. Partial recruitment to the fishery for the 9+ group was set at 1. Highlighted cells (yellow and green) indicate the 2010 year class at ages 1 to 4 and the 2003 year class at age 8 and in the 9+ group. Highlighted F values indicate values greater than the F_{ref}. Biomass at the beginning of 2014 is highlighted to facilitate comparison between scenarios.

				Age Group										
Quota	**Year**	**F**		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9+**	**1+**	**3+**
22K	2011		Biomass	10,586	1,464	1,995	4,426	2,317	7,176	1,169	64,388	11,249	104,770	92,720
	2012			400	50,127	2,237	2,232	3,386	1,591	6,693	917	114,602	114,602	64,075
	2013			206	2,610	72,642	2,406	1,590	2,022	1,136	4,125	113,395	113,395	110,579
	2014			206	1,344	3,941	105,280	1,580	807	1,227	561	129,172	129,172	127,621
	2011	0.244	Catch	96	44	221	631	642	2,264	337	14,803	2,962	22,000	21,860
	2012	0.387		15	223	387	488	1,397	684	2,355	384	16,066	22,000	21,761
	2013	0.550		11	178	4,576	720	867	1,150	550	1,907	12,042	22,000	21,811
20K	2011		Biomass	10,586	1,464	1,995	4,426	2,317	7,176	1,169	64,388	11,249	104,770	92,720
	2012			400	50,127	2,237	2,232	3,386	1,591	6,693	917	114,602	114,602	64,075
	2013			206	2,611	72,653	2,436	1,623	2,107	1,184	4,299	114,908	114,908	112,091
	2014			206	1,345	3,961	105,718	1,663	890	1,383	633	131,834	131,834	130,283
	2011	0.244	Catch	96	44	221	631	642	2,264	337	14,803	2,962	22,000	21,860
	2012	0.345		14	200	347	440	1,271	623	2,142	349	14,615	20,000	19,787
	2013	0.471		10	153	3,933	636	786	1,064	509	1,764	11,144	20,000	19,838
18K	2011		Biomass	10,586	1,464	1,995	4,426	2,317	7,176	1,169	64,388	11,249	104,770	92,720
	2012			400	50,127	2,237	2,232	3,386	1,591	6,693	917	114,602	114,602	64,075
	2013			206	2,612	72,665	2,466	1,656	2,193	1,233	4,475	116,426	116,426	113,607
	2014			206	1,346	3,979	106,113	1,743	974	1,544	706	134,509	134,509	132,956
	2011	0.244	Catch	96	44	221	631	642	2,264	337	14,803	2,962	22,000	21,860
	2012	0.305		12	176	309	392	1,145	561	1,929	314	13,161	18,000	17,811
	2013	0.402		8	130	3,356	557	705	973	466	1,614	10,191	18,000	17,861
16K	2011		Biomass	10,586	1,464	1,995	4,426	2,317	7,176	1,169	64,388	11,249	104,770	92,720
	2012			400	50,127	2,237	2,232	3,386	1,591	6,693	917	114,602	114,602	64,075
	2013			206	2,613	72,677	2,494	1,688	2,279	1,281	4,650	117,946	117,946	115,127
	2014			206	1,347	3,996	106,470	1,820	1,058	1,708	782	137,195	137,195	135,642
	2011	0.244	Catch	96	44	221	631	642	2,264	,337	14,803	2,962	22,000	21,860
	2012	0.267		11	154	271	346	1,018	499	1,716	280	11,706	16,000	15,835
	2013	0.339		7	110	2,835	483	623	878	420	1,455	9,190	16,000	15,883
14K	2011		Biomass	10,586	1,464	1,995	4,426	2,317	7,176	1,169	64,388	11,249	104,770	92,720
	2012			400	50,127	2,237	2,232	3,386	1,591	6,693	917	114,602	114,602	64,075
	2013			206	2,614	72,687	2,522	1,720	2,366	1,330	4,827	119,469	119,469	116,648
	2014			206	1,348	4,011	106,795	1,893	1,141	1,877	859	139,890	139,890	138,336
	2011	0.244	Catch	96	44	221	631	642	2,264	337	14,803	2,962	22,000	21,860
	2012	0.230		9	133	235	300	891	437	1,502	245	10,248	14,000	13,858
	2013	0.282		6	92	2,362	412	542	778	372	1,290	8,146	14,000	13,902