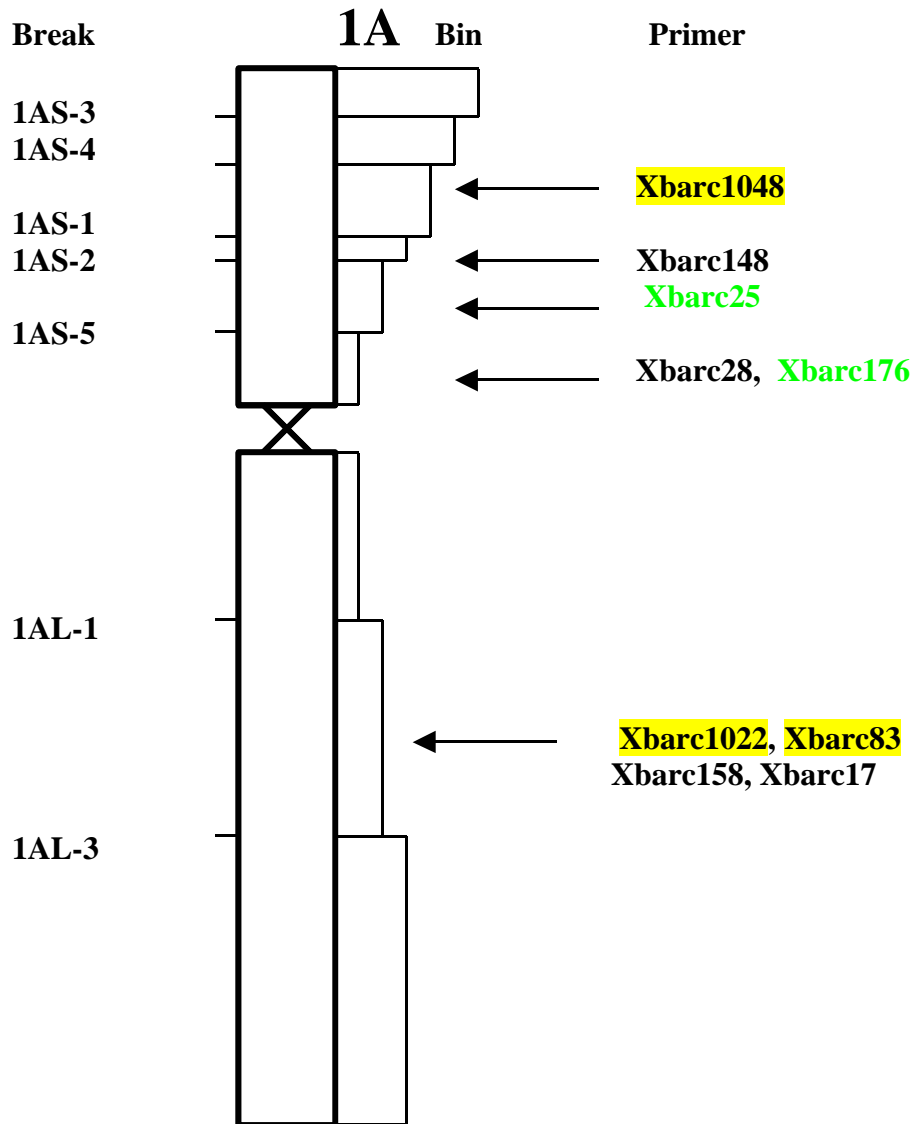


The map information available in the links listed below is based on preliminary analyses. BARC primer pairs are developed by P. Cregan, Q. Song and associates. Meiotic map information was developed by J.R. Shi, R. Ward and associates. Deletion map information was developed by B. Gill, S. Singh and associates. Funding for this research is provided by USDA-ARS in conjunction with the U.S. Wheat and Barley Scab Initiative. All rights to publication of map position, etc. are reserved. Please contact R. Ward ([wardri@msu.edu](mailto:wardri@msu.edu)) prior to use of this information.



XksuD14.1	0
XGli1	2.4
XksuD14.2	5.3
Xgwm136	
Xgwm33	
Xbarc263	
Xcdo426	15.1
Xabc156	21.8
XGli3	23.5
XksuE18	24.2
Xbcd98.1	28.2
Xbcd98.2	
XksuG9	32.9
Xbarc148	
Xmwg67	34.9
Xcdo580	35.8
Xrz244	36.9
Xgwm164	
Xbcd1072	40.7
Xabg373	41.2
Xbarc028	
Xcdo98	41.2
Xwg605	41.4
Xabg452	41.4
Xcdo473	46.7
Xbcd1407	
Xgwm357	
Xgwm135	
Xcdo312	54
Glu-A1	60.1
XksuE3	
Xbcd808.2	
Xbcd1889	
Xbcd1930	
Xcmwg733	72.7
Xbcd265	74.8
Xcmwg706	83.8
XksuH9	
XksuH14	86.7
Xgwm497	
Xgwm666	

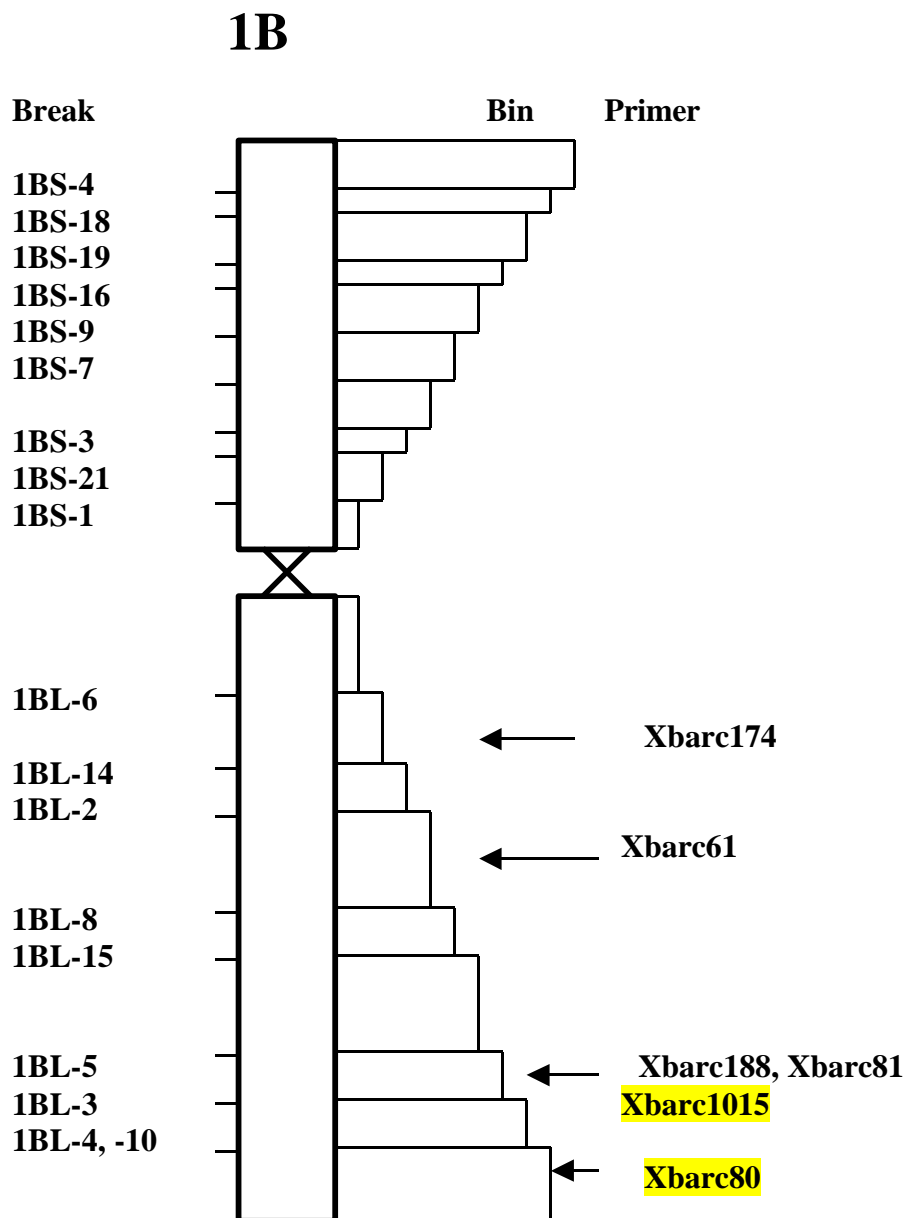
**Xbarc (Beltsville Agric Research Center): Named markers**

**Microsatellite markers with red font yellow highlight : markers mapped in ITMI lines only.**

**Microsatellite markers with black font yellow highlight: markers mapped in nulli tetrasomic lines only.**

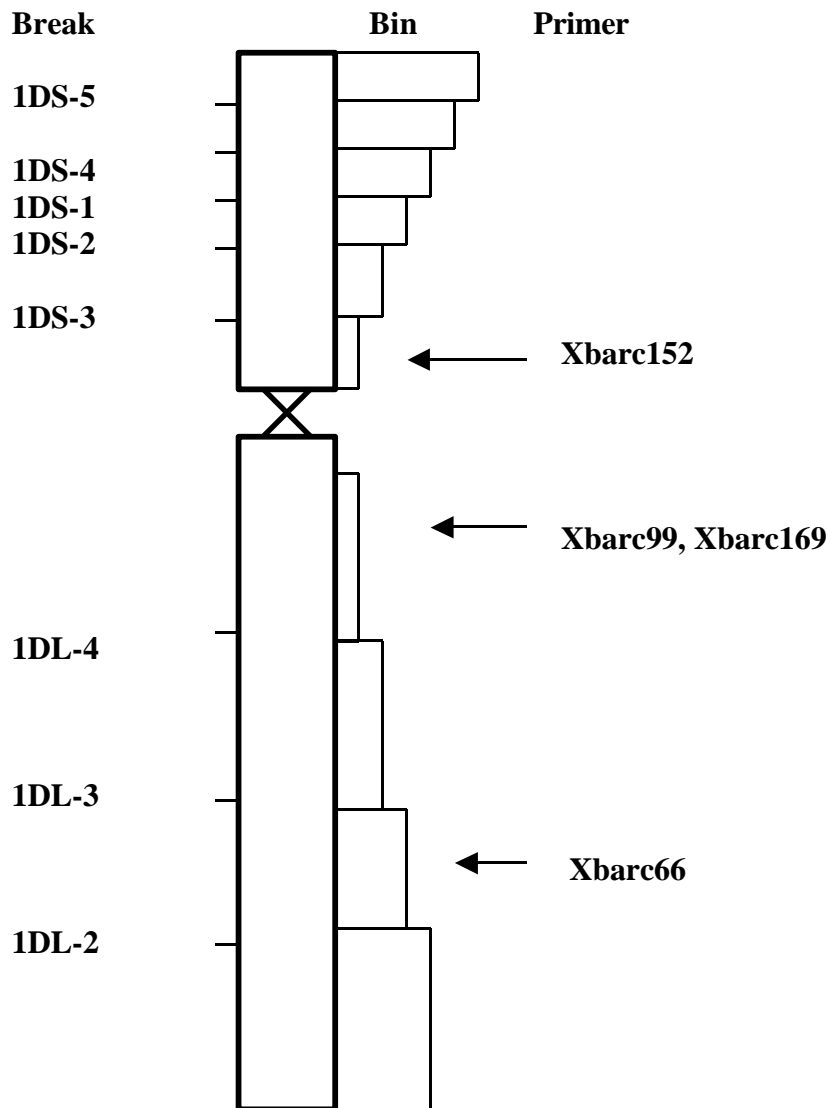
**Microsatellite markers with green color: markers mapped on different linkage groups.**

**microsatellite with other colors: markers mapped on both ITMI and nulli-tetrasomic lines.**

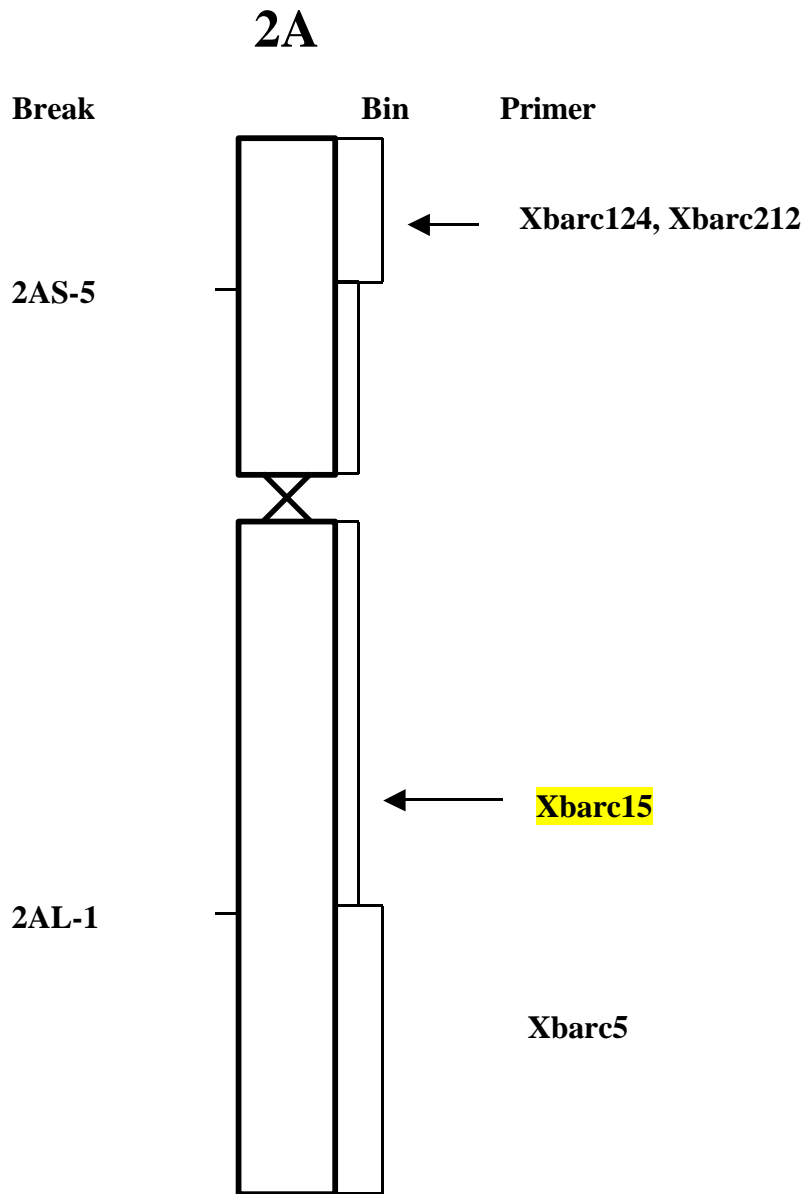


XksuE11.2	
XksuD14	0
Xcdo388	
Xmwig938	11.5
Xmwig68	
Xabc156	
XGli3	13.4
XksuF43.1	18.5
XksuF43.2	
XksuE18	20.8
XksuE19	
Xbcd1124	
Xbcd340	
Nor-B1	27.5
Xrz166	
Xcdo1340	
Xbcd1796	
Xcdo1173	29
Xbcd338	29.6
Xwg605	29.6
Xbcd12	30.8
Xcdo278	
Xgwm498	
Xbarc187	
Xbarc240	
Xbarc137	
Xbarc181	
Xbarc174	
Xgwm131	
Xbarc061	
Xcdo637	36.4
Glu-B1	
Xbcd1150.1	44
Xbcd1150.2	48.4
Xgwm403	
Xcmwig733	56.4
Xbcd442	62.6
Xbarc188	
Xbarc081	
Xgwm153	
Xbcd441	
Xbcd304	70.8
XksuG34	71.6
Xbcd1562	
Xbcd508	88.1
Xbcd1514	93.4
Xbcd1261	93.4
Xcdo1189	93.4
Xcdo346	104.3
Xgwm259	
Xgwm140	
Xbarc080	
Xmwig912	113.4
XksuE11.2	113.4
XksuL27	116.7

# 1D



XGli1	0
<b>Xbarc149</b>	
XksuD14.1	8.9
Xbcd1434	8.9
XksuD14.2	8.9
Xwhs179.1	
Xmwig938	11.6
Xwhs179.2	
Xgwm33	
<b>Xbarc152</b>	
Xmwig837	19.4
Xcnl7	20.2
Xabc156	22.3
Xgwm106	
Xgwm337	
<b>Xbarc229-2</b>	
<b>Xbarc099</b>	
<b>Xbarc229</b>	
<b>Xbarc169</b>	
Xcdo312	54
Glu-D1	
XksuG2	
XksuG55	59.8
XksuD49	60.4
Xgwm642	
Xbcd1930	
Xcmwg733	67.7
<b>Xbarc066</b>	
Xcmwg701	87.9
XAdh	87.9
XATPase	
Xbcd508	
Xcmwg693	
Xbcd1261	121.3
Xgwm232	
Xcdo1420	
XksuE11	129.3
Xksul27.1	130.5
Xksul27.2	133.9
Xwg241	136.8
<b>Xbarc119</b>	
<b>Xbarc062</b>	



Xbcd348.1	0
Xcmwg682	
Xcdo456.1	4.8
Xfba82	
Xfba70.1	
Xcdo447	7.5
Xcdo456.2	24.8
Xfba70.2	
Xgwm497	
Xgwm614	
Xgwm636	
Xbcd348.2	43.5
<b>Xbarc212</b>	
<b>Xbarc124-1</b>	
Xbcd718	
Xcdo57	48.5
Xcdo1090	48.8
Xgwm512	
Xgwm296	
XksuD18	
Xbcd1970	48.8
Xfbb61	49.2
Xfba178	67.3
Xfbb329	75.7
Xfba272	76.6
Xbcd1184	78
Xfba300	
Xfbb226	
Xwsu1	
Xbcd152	98
Xcdo1281	100.6
Xfba106	
Xgwm95	
Xbcd1688	
Xcdo405	
Xbcd855	
Xbcd161	101.2
Xrz395	101.2
Xfba374	
Xfbb359	
Xgwm448	
Xgwm275	
Xcdo1376	103.7
Xgwm71.2	
Xgwm558	
Xfbb212	
<b>Xbarc005</b>	
Xfbb353	
Xbcd543	110.6
Xgwm445	
XksuE16	119.2
XksuD22	120.5
Xbcd1095	123.9
Xfba276	
Xgwm294	
Xgwm312	
Xpsr934	137.1
Xfba385	143.3
Xgwm356	
Xcdo678	145.4
Xcdo1410	
XksuF41	
Xbcd292	146.1
Xbcd410	
XksuH16	148.4
Xgwm382	
Xgwm311	
XksuF11	154.4
Xfba8	
Xfba314	162.1



# 2D

Break

Bin

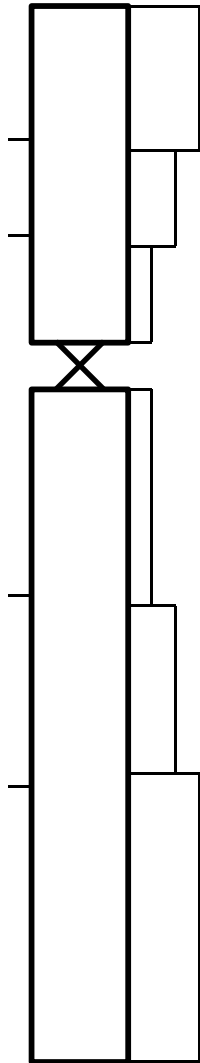
Primer

2DS-5

2DS-1

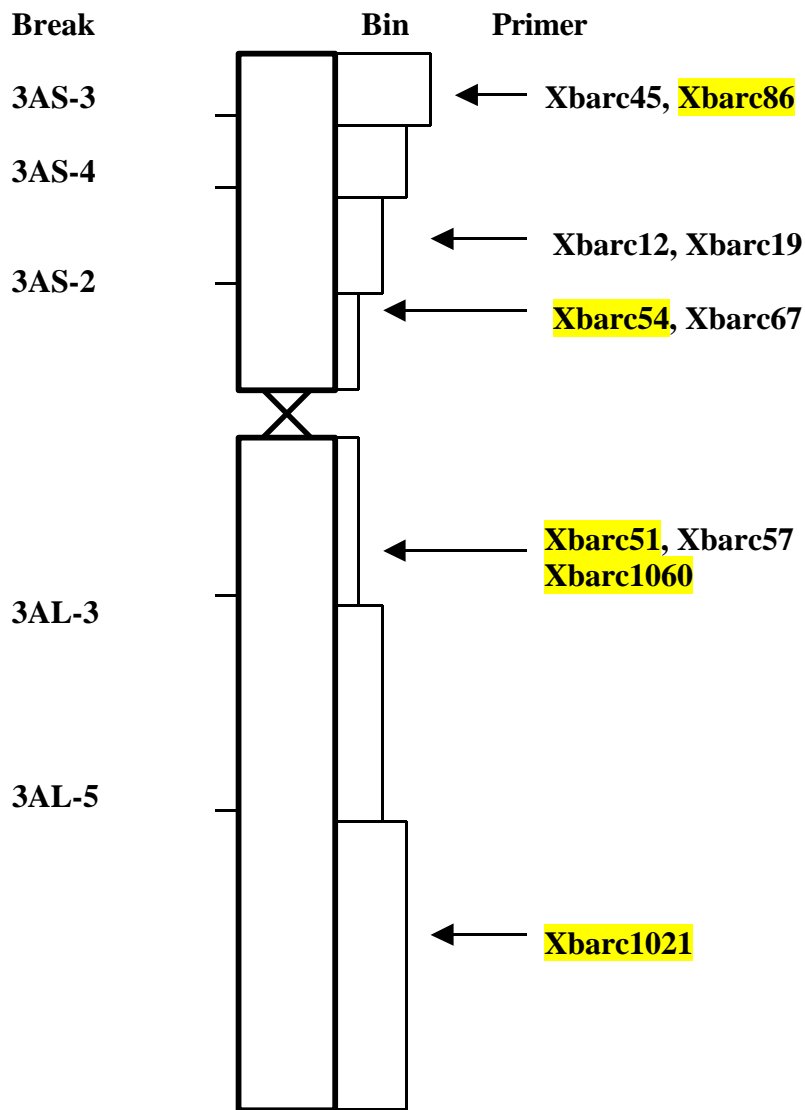
2DL-3

2DL-9



W21	0
Xcmwg682	11.3
Xcdo456	18.8
<b>Xbarc124</b>	
Xfba83	
Xgwm210	
Xgwm296	
Xgwm261	
Xbcd18	23.6
Xbcd1970	25
Xbcd718	27.8
Xbcd102	31.3
Xgwm455	
Xfba400	40
Xfba88	40.7
Xbcd611	
Xcdo1379	54.9
Xfba272	
Xcdo1479	72
Xgwm484	
Xbcd262	79.3
<b>Xbarc168</b>	
Xgwm102	
Xfbb279	
Xfba341.1	
Xcdo405	
Xwsu1	100.4
Xgwm515	
Xbcd260	112
<b>Xbarc145</b>	
Xfba38	
Xgwm30	
Xgwm249	
Xgwm608	
Xgwm539	
Xbcd111	120.7
<b>Xbarc011</b>	
Xbcd120	120.7
Xgwm157	
Xtam8	128.9
Xfbb99	129.8
Xfba74	130.5
Xfbb32	
Xfbb122	135.7
Xfba111	135.7
Xfba64	
Xfba62	
Xfbb284	137.3
Xfba61	137.3
Xfba341.2	
<b>Xbarc228</b>	
Xcdo1008	145.2
Xfbb68	
Xfba116	149.6
Xfbb9	150.5
Xfbb251	154.9
Xfbb72	159.4
Xgwm349	
XksuH9	165.8
Xglk558	166.5
XksuD23	167.6
Xrz444	
XksuH16	168.4
<b>Xbarc159</b>	
Xgwm382	
Xgwm311	
Xgwm320	
Xcdo36	172.5

# 3A



Xbarc057	
Xbarc012	
Xglk683	0
Xtam61	10.5
Xco460	17.5
Xb1428	24.7
Xfa91	25.6
Xco395	29.5
Xb1823	40.1
Xb706	41.6
Xmg22	42.3
Xmg14	42.3
Xbarc045	
Xbarc019	
Xbarc067	
Xbarc025	
XksA6	45.7
Xco638	46.6
Xpsr903	50.3
XATPs	52.7
Xco1174	53.4
Xb828	53.9
Xco118	54.7
Xwg177	59.6
XksH2	60.8
Xb115	63.2
Xfb271	65.3
Xmg961	66.1
Xfb353	71.8
Xfa175	82.1
Xbarc197-1	
Xmg30	106
Xfb293.1	152.3
Xb1773	156.7
Xtam63	164
Xac172.1	175.8
Xac172.2	194.2
Xfb293.2	201.9
Xfb237	207.4
Xmg11	207.4
Xco482	214.3
Xb451	246.2

# 3B

Break

3BS-8

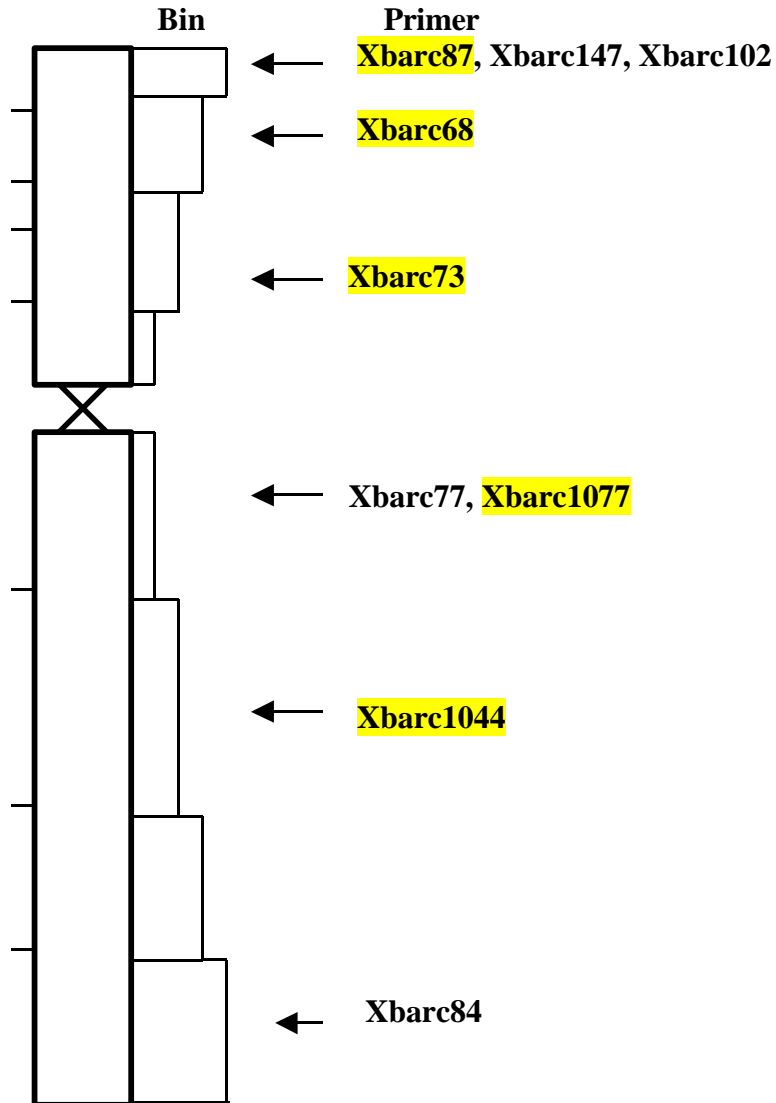
3BS-9

3BS-1

3BL-2

3BL-10

3BL-7



Xb907	0
XksG53 9	
Xfa190	13.3
Xfb166	15.6
Xbarc147	
Xbarc133	
Xbarc075	
Xbarc102	
Xco460	24
Xtam47	31.2
Xtam61	40.6
Xfa91	63
Xfb142	69.3
Xfb315	69.3
Xfb24	70.2
Xco116473.8	
XATPs.193.3	
Xb1380.1	98.1
XksH7	101.1
Xco328	102.4
Xpsr689 105	
Xpsr903 106.9	
Xcn18	110.1
Xfb117	110.1
Xfb156	113.1
XATPs.2116.5	
Xb809	119.4
Xb1418	120.9
Xco718	122.4
Xbarc164	
Xmg818 123.9	
Xmg69	136.2
Xfb378	142.2
Xb131	164.9
Xac174	178.3
Xfa360	190.7
Xbarc077	
Xbarc084	
Xco105	192.9
Xbg131	203.2
Xfa8	207.9
Xfa235	211.3
Xtam63	218.3
Xmg11	243.1

# 3D

Break

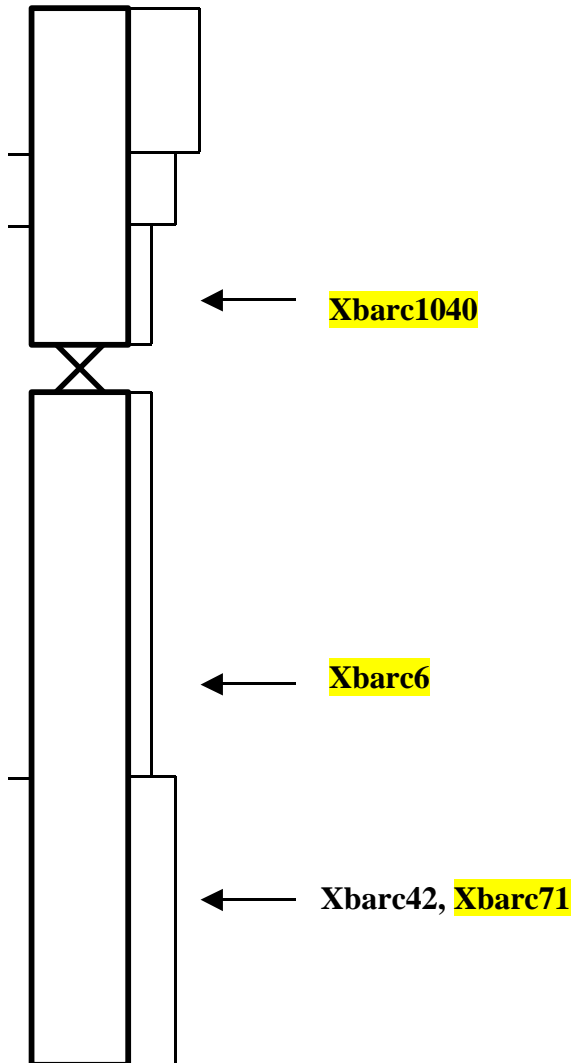
Bin

Primer

3DS-6

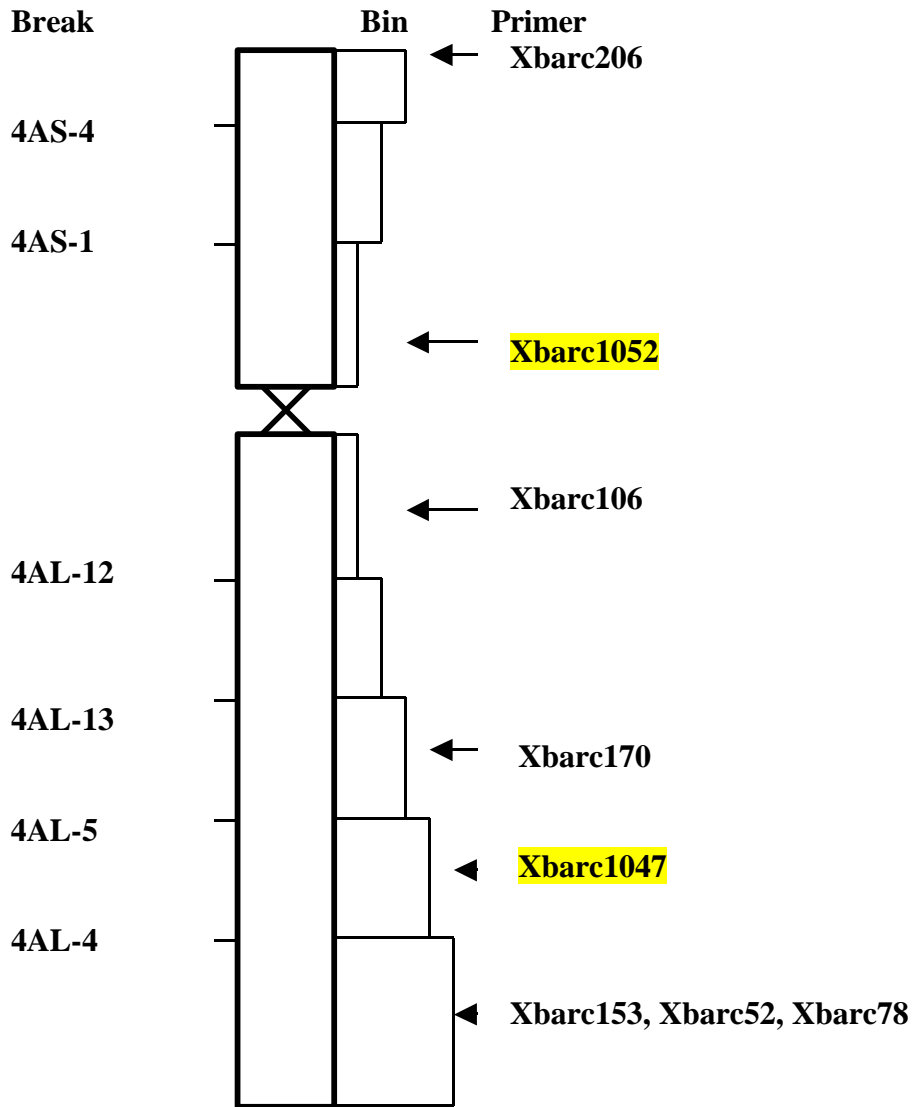
3DS-3

3DL-3



Xco549	0
Xfb370	11.1
Xfa91	33.8
Xfa241	41
Xb1532	44.1
Xco1435	45.8
Xmg22	47.5
Xco407	49.6
Xbarc006	
Xbarc008	
XksA6	54.5
Xmg688	68.6
Xb134	71
Xac176	77.9
Xb288	81.2
Xfb237	86.5
Xb22	100.2
Xbarc042	
Xb1555	100.2
Xwg110	103
Xb515	103.9
XksH15	107
Xb361	109
Xfa310	111.9
Xfa27	117.1
Xcnl2	118
Xfa389	118
Xfb269	118.1
Xfb316	119.6
XksG59	159.4

# 4A



Xfb1	0
Xfa40	8.6
Xfa78	8.6
Xfb227	13.1
Xbarc206	
Xbarc106	
Xbarc138	
Xfa320	13.1
Xco1387	15.2
Xco959	15.2
XksF8	17.3
Xfa211	20.5
Xb8	26
XksG12	30.8
Xwg622	32.9
Xbarc170	
Xmg549	58
Xabg390	60.5
Xb1670	62.5
Xco475	69.5
XksD9	71.4
Xb130	75.3
Xfa231	76.8
Xfb154	78.8
Xco545	83.9
Xbarc078	
Xfb114	95.5
Xbarc052	
Xbarc070	
Xb129	133.3
Xbarc153	
Xbarc184	

# 4B

Break

Bin

Primer

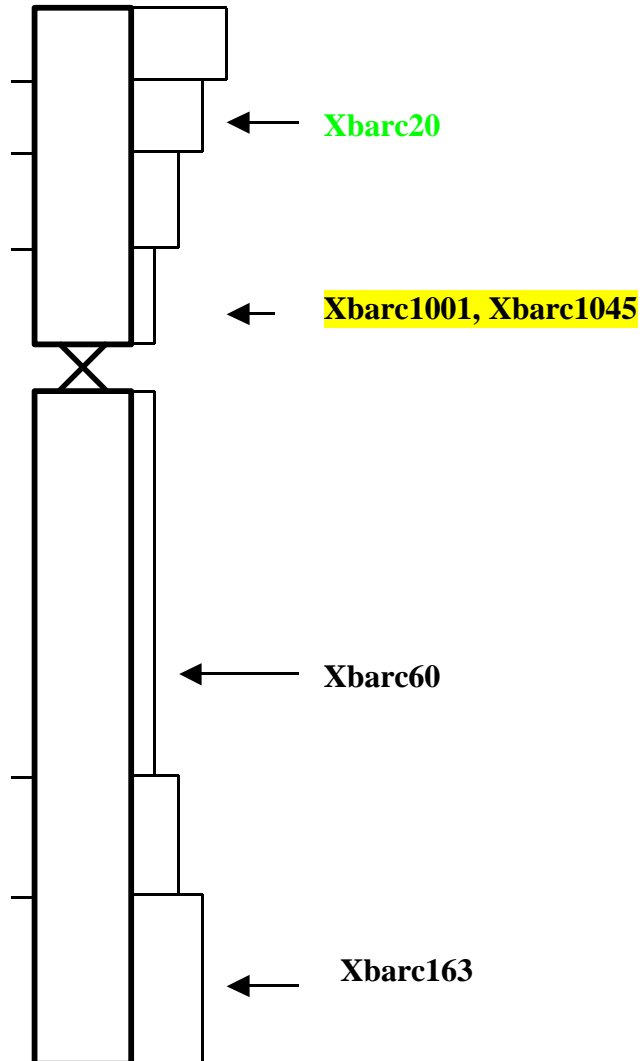
4BS-1

4BS-8

4BS-4

4BL-5

4BL-1



Xfa78	0
Xco795	10.1
Xb1262	12.4
Xco938	12.4
Xabg484	12.4
Xrz251	12.9
Xb1265	18.1
Xco1401	21.6
Xcnl7	22.2
XksG10	22.2
Xmg2025	22.2
<b>Xbarc060</b>	
Xco1312	23.4
<b>Xbarc163</b>	
XksE2	23.4
Xco20	26.3
Xco1528	26.3
Xfb255	41.6

# 4D

Break

Bin

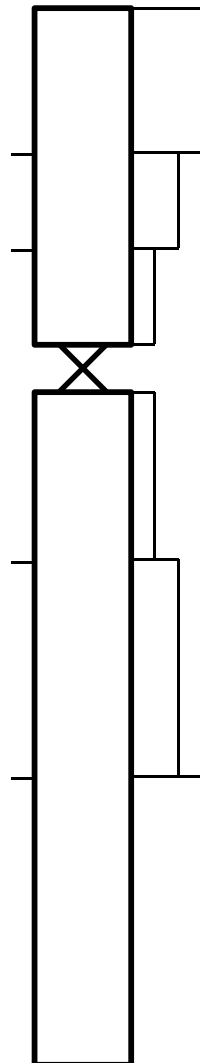
Primer

4DS-3

4DS-1

4DL-9

4DL-13



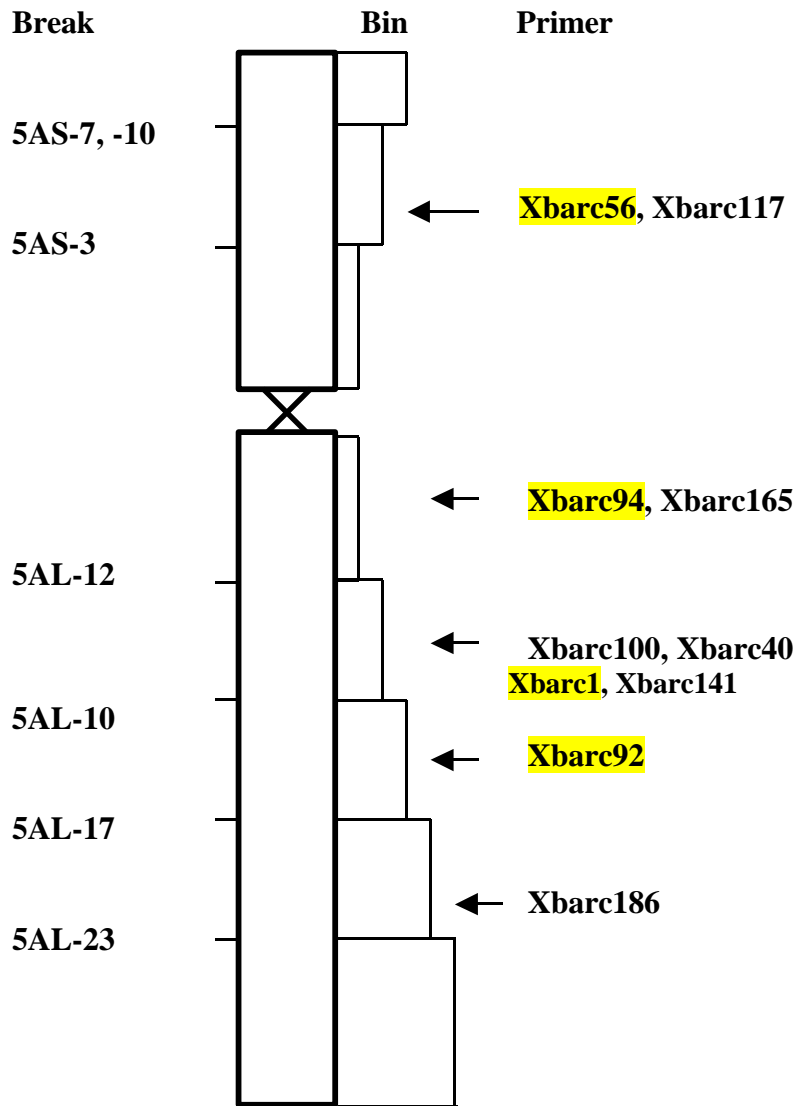
Xbarc98

Xbarc93

Xbarc1069

Xmg634	0
Xco669	21.6
Xbarc225	
Xb265	41.3
Xb327	47.2
XksF8	50.7
Xbarc098	
Xb1117	54.7
Xb15	60.7
Xfb178	65.8
Xco1312	72.1
Xb1431.1	82.8
Xbarc048	
Xfa177	107.2
Xbarc122	

# 5A



Xb1871	0
Xbarc186	
Xbarc180	
Xbarc117	
Xco785	12.4
Xb1355	18.4
Xbarc100	
Xbarc040	
Xbarc165	
Xco412	23.4
Xbarc141	
Xb981	27.3
Xb926	27.3
Xco1090	29.2
Xmg522	32.4
Xbarc197-2	
Xmg624	38.6
Xfb2	41.4
Xb1235.1	47.4
Xbarc151	
Xb183	60.1
Xrz395	74.5
Xco1326	80.3
Xfa351	86.7
Xco1312	99.6
Xco20	105
Xmg2112	116.3

# 5B

Break

Bin

Primer

5BS-6

5BS-5

5BS-8

5BS-4

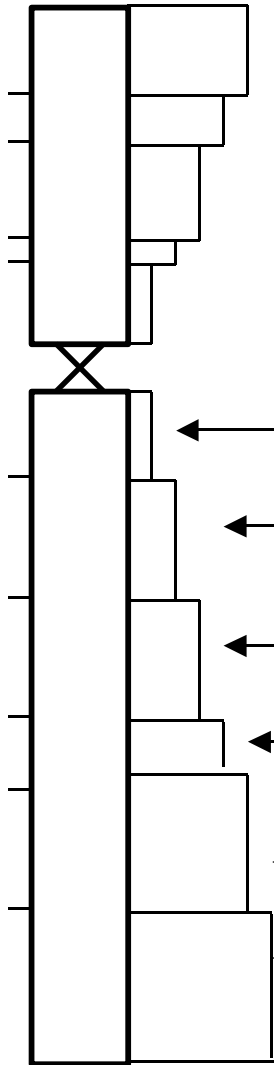
5BL-6

5BL-1

5BL-14

5BL-9

5BL-16



Xbarc11, Xbarc58, Xbarc89

Xbarc74

Xbarc4, Xbarc59, Xbarc88  
Xbarc1032, Xbarc140

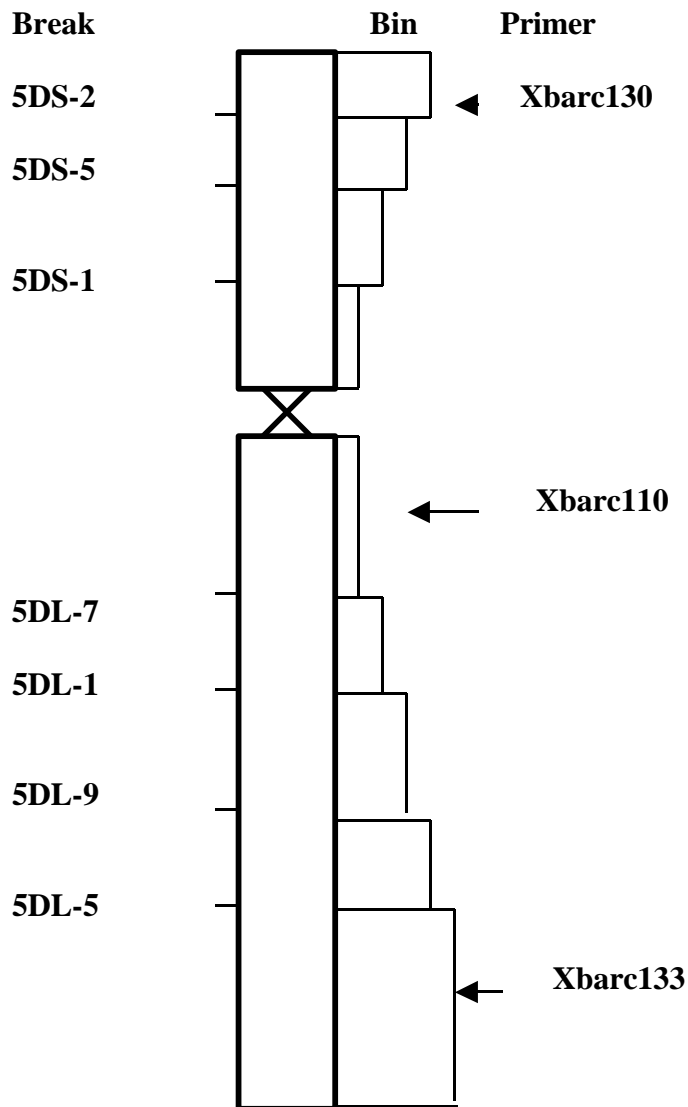
Xbarc1061

Xbarc69, Xbarc109, Xbarc142

Xbarc32

Xb873	0
Xfa367	14.4
Xfa393	20.4
Xfa342	22
Xb1871	24.2
Xbarc216	
Xbarc109	
Xbarc004	
Xpsr929	28.4
Xbarc032	
Xmg561	30.3
Xpsr128	31.7
Xb157	34.4
Xco412	35.5
Xb1140	42
Xbarc074	
Xbarc089	
Xmg52	46.9
Xabg473	49.6
Xmg914	63.3
Xb307	68.6
Xb9	71.7
Xwg583	72.8
Xfa166	74.2
Xb1030	86
Xb450	91.5
Xco504	91.5
Xbarc140	
Xco1326	104.8
Xco584	108.1
Xac310	172.8

# 5D



Xfa393	0
Xfb238	8.4
Xfa137	12.2
XksD30	16.2
Xbarc143	
Xbarc205	
Xmg561	22.7
Xco412	28.4
Xbarc044	
Xco57	38.6
Xco1508	100.2
Xb450	120.7
Xbarc093	
Xmg900	137.5
Xb1103	152.2
Xco346	165.1
Xfb100	173.2
Xbarc110	
Xb1670	185.9
Xbarc177	
Xb1421	197.7
Xco506	207.2
Xb197	207.2
Xbarc144	

# 6A

Break

Bin

Primer

6AS-1

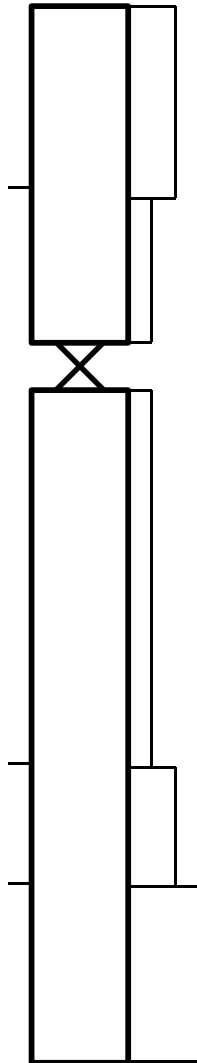
Xbarc3

6AL-2

Xbarc37, Xbarc107  
Xbarc1055, Xbarc113

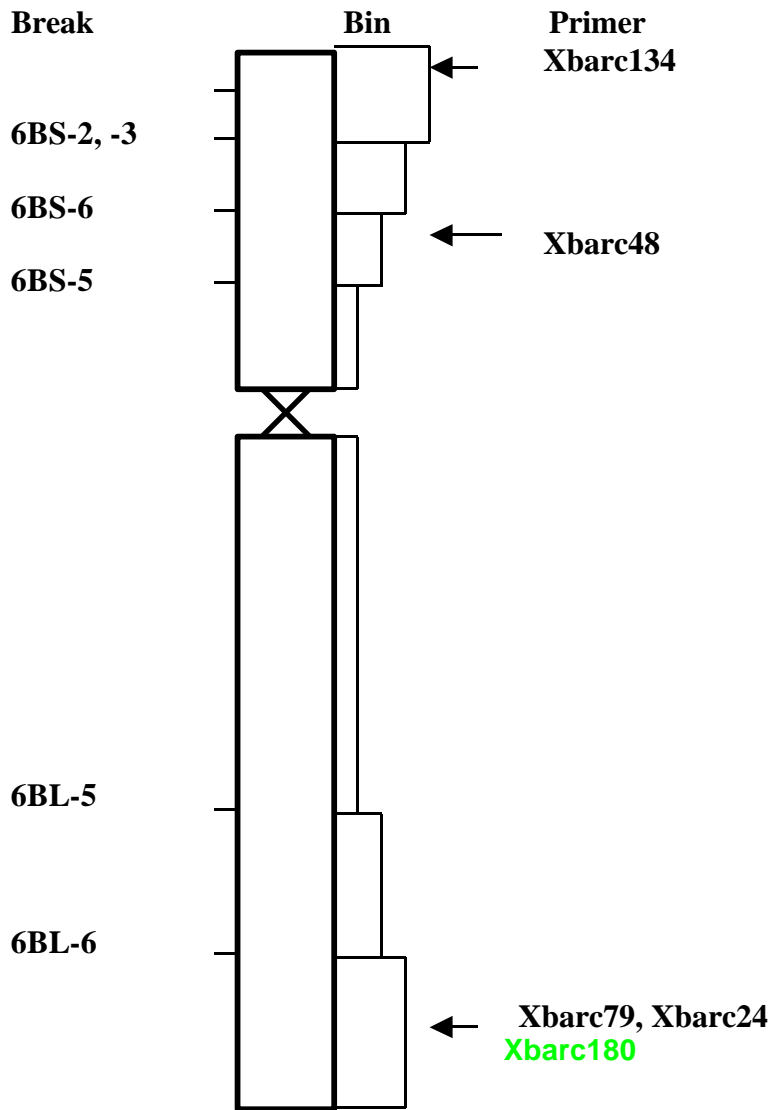
6AL-8

Xbarc204



Xpsr167	0
Xb342	1.4
Xb1821	3.3
Xco476	5.7
Xfb209	8.8
Xfa307	15.2
Xcmwg652	17.6
XksG48	19.9
Xpsr10	26.2
Xfa85	35.3
Xfa152	35.3
Xfb145	47
Xfa148	53.8
Xbarc003	
Xbarc195	
Xbarc171	
Xco270	58.3
Xfa234	66.8
Xco29	66.8
Xb758	70.9
Xfa367	70.9
Xb1860	72.2
Xpsr463	73.6
Xbarc107	
Xbarc113	
Xtam36	74.5
Xco388	80.4
Xbarc204-1	
Xcsb112	98
Xfa20	119
Xfa111	119
Xfb40	119
Xfb82	122.8
XksD27	125.6
Xmg573	131

# 6B



Xb342	0
Xrz995	20.1
XksH4	24.5
Xfa152	27
Xbarc048-2	
Xfa357	31.7
Xfa344	37.3
Xfa345	37.3
Xbarc198	
Xb1383	40.9
Xb1495	42.4
Xco524	43.8
Xcnl3	43.8
Xbarc079	
Xb1716	43.8
Xco507	48.3
Xbarc024	
Xco341	57.9
Xmg934	60
Xfb57	61.9
Xfb169	61.9
Xfa42	64.6
XksG30	66.6
Xbarc178	
Xfb377	69.4
Xfb327	79.4
Xfb359	79.4
Xbarc134	
Xfb82	87.9
Xfa251	94

# 6D

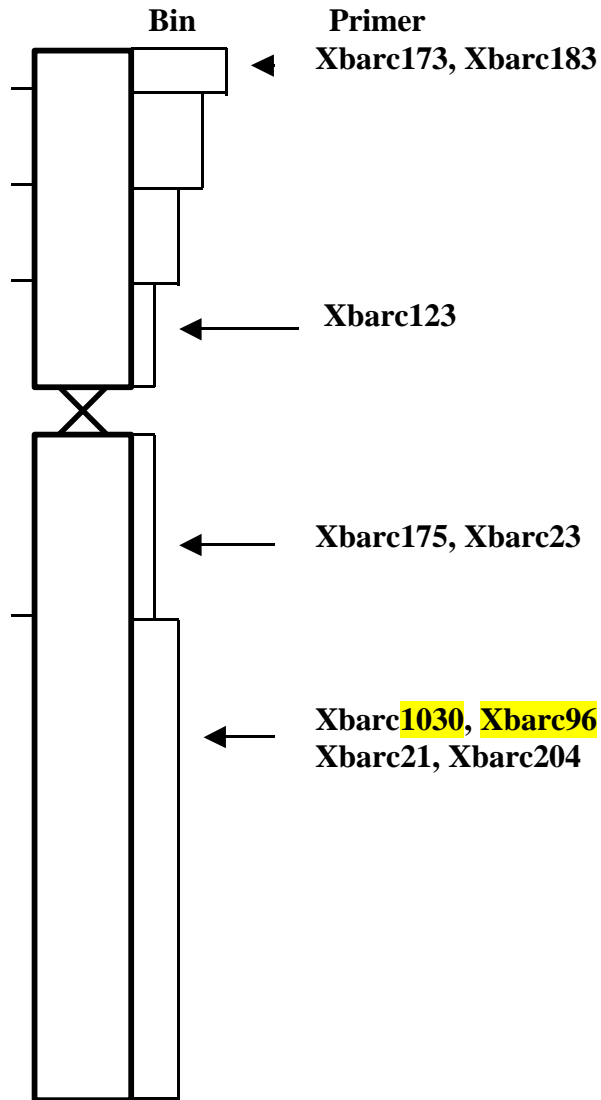
Break

6DS-6

6DS-4

6DS-2

6DL-6



Xpsr889	0
Xb1821	6.4
Xb342	9.2
Xbarc183	
Xbarc173	
Xpsr964	15.5
XXp3	23.7
XksG48	27.1
Xfb319	37.6
Xfb222	44.4
Xpsr106	52.1
Xco270	58.3
Xbarc196	
Xbarc023-2	
Xac173	64.9
Xbarc123	
Xbarc202	
Xbarc146	
Xfa336	67.4
Xb1716	69.3
Xac175	76.1
Xbarc175	
Xfb231.2	83.6
Xbarc204	
Xfa81	97.1
Xcmwg669	105.2
Xcsb112	106.3
XksE14	112.2
Xb1319	117.6
Xb1510	128.2
Xbarc021	
XksD27	147.8
Xmg2053	154.5

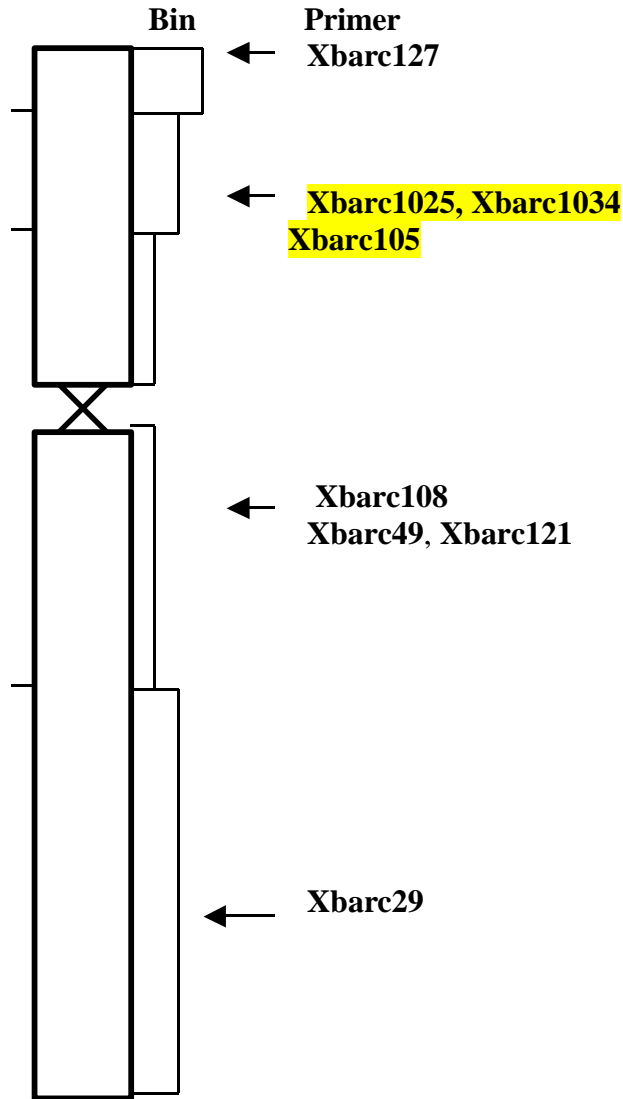
# 7A

Break

7AS-5

7AS-8

7AL-1



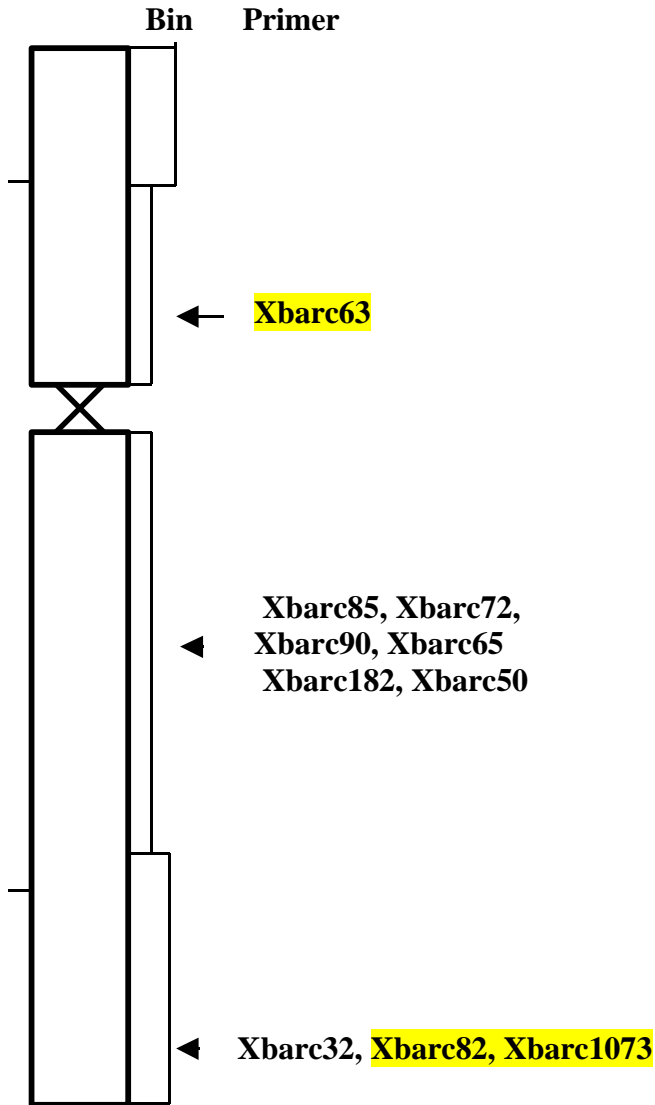
Xco545	0
Xfa127	31.8
Xfa109	40.7
Xfb186	43.6
Xfb67	43.6
Xco475	50.2
Xfa42	58.7
Xbarc127	
Xac158	69.1
Xfa248	77.6
Xfa340	89.1
Xfb264	104.9
Xbarc108	
Xb1066	113.8
Xfa234	121.5
Xco962	125.3
Xbarc121	
XksG12	136.5
Xfa354	143.8
Xbarc49	
Xbarc29	
Xfa69	158.2
Xfa350	176.2
Xwg380	181.2
XksD2	184.7
Xmg938	188.9
Xrz682	188.9
Xfb18	195.2
XksH9	223.1

# 7B

Break

7BS-1

7BL-7



Xfa42	0
Xbarc85	
Xbarc72	
Xbarc90	
Xbarc65	
Xfb150	20.5
Xb310	24.4
Xbarc176	
Xcnl8	24.4
Xwg180	27.2
Xb385	31.4
Xb98	32.9
Xco551	32.9
Xac455	35.8
Xb178	39.3
Xrz476	41.7
Xcnl7	42.8
Xwg514	46.5
Xfb179	50.7
Xfa305	54
Xwg686	54.9
Xfa259	66.5
XksD2	91.9
Xfbb189	
Xbarc50	
Xbarc20	
Xgwm344	
Xgwm146	
Xbarc182	
Xrz508	
Xcdo414	
Xcnl2	
Xgwm611	
Xgwm577	
XksuE18	

# 7D

Break

Bin

Primer

7DS-6

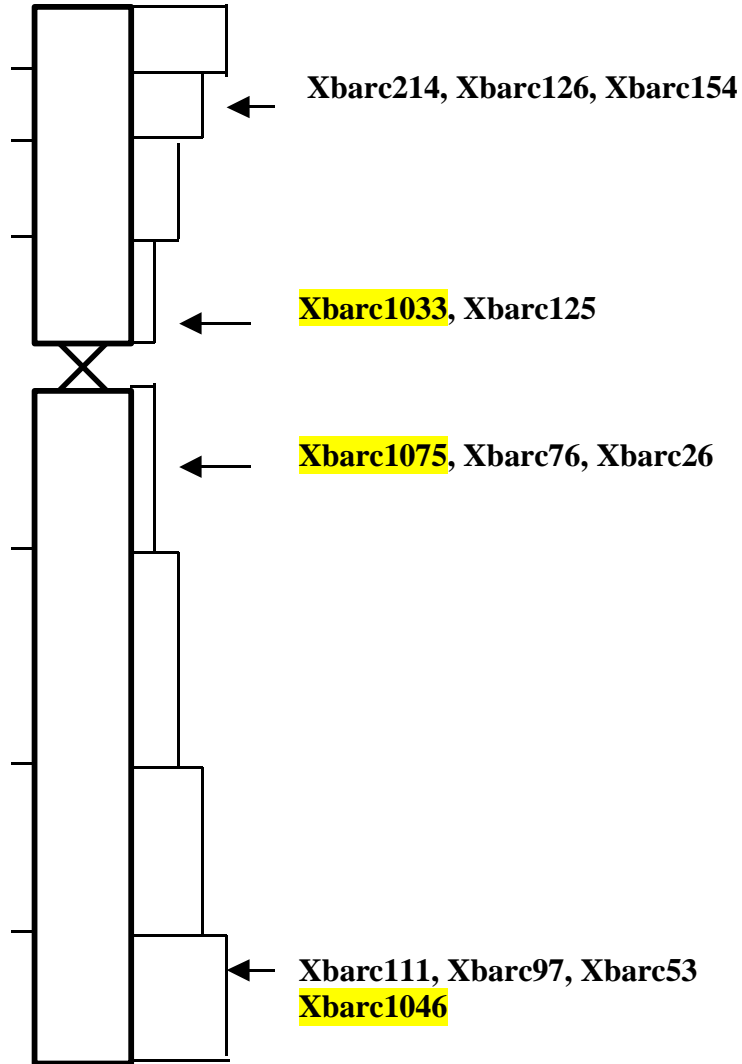
7DS-4

7DS-5

7DL-5

7DL-2

7DL-3



Xb1872	0
Xwg834	14
Xb1438	18.7
Xcnl6	27.3
Xmg710	44.4
Xbarc154	
Xrz2	64.8
Xbarc125	
Xbarc126	
Xfa377	90.2
Xgwm44	
Xbarc214	
Xgwm111	
Xb707	109.7
Xbarc26	
Xgwm437	
Xwg719	119.8
Xbarc172	
Xco775	128.4
Xbarc121-2	
Xgwm121	
Xfb79	159.9
Xmg975	165.2
Xbarc111	
Xwg420	172.9
Xfa204	180.7
Xgwm428	
XksuE3	
Xgwm37	
Xbarc53	
Xbarc76	
Xfbb189	