

## Appendix 5

### ASSESSMENT OF CURRENT REPRODUCTIVE DATA FOR THE WESTERN NORTH ATLANTIC RIGHT WHALE

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Since 1980, the birth of a total of 221 right whale calves has been documented in the western North Atlantic. Of these, seven are known to have died and 54 were not photographically identified (Table 1). An analysis of sighting data shows that 57% of the calves were brought to the Bay of Fundy by their mothers (Fundy calves, Table 1) and 43% were not taken to the Bay of Fundy (Non-Fundy calves, Table 1). The mothers of non-Fundy calves use a yet unknown summering and nursery location (Malik et al, 1999). Since 1987, genetic analyses have been used to assess population structure and reproduction in the North Atlantic right whale. Eighty-five mother-calf pairs have been sampled and genetically analyzed (Total genotyped, Table 2). These 85 pairs comprise 52% of the total mother-calf pairs for which the calf was photo-identified (Table 2). Of the mother-calf pairs that have been sampled, 60.0% of those seen in the Bay of Fundy have been sampled, and 32.5% of those not seen in the Bay of Fundy have been sampled (Table 3). Genetic analyses of these samples, using both mitochondrial DNA (mtDNA) and nuclear DNA, have shown that there is significant population substructuring between calves that are brought to the Bay of Fundy and calves that are not brought to the Bay of Fundy in their first year by their mothers (Malik et al, 1999, Waldick 1999). This substructuring is the result of site fidelity to a specific summer habitat area on the part of right whale mothers. They bring their calves either to the Bay of Fundy (Fundy calves) or to an unknown summer area (Non-Fundy calves). Offspring tend to show the same site fidelity as their mothers. This pattern of differential habitat use means that some lineages use the Bay of Fundy in summer and others use an unknown area. Genetic studies show that there is also a degree of reproductive isolation between these two groups, suggesting that they could be using different mating areas and that they are therefore more distinct than previously thought (Waldick 1999).

The population substructuring described above is of increasing interest when considering reproduction over the past three years, during which time no mothers from the Fundy subgroup have produced offspring (Table 1, plus data from the calving season of 2000; Phil Hamilton, pers. comm.). This skew in reproductive performance could indicate that there are recent and crucial differences in other aspects of the two subgroups, such as habitat quality and mortality due to anthropogenic factors. Such differences between subpopulations within the North Atlantic right whale population should be of primary consideration in all future studies of this population as conservation efforts are often futile when population structure is not taken into account (Taylor and Dizon 1999).

#### References

- Malik, S., M.W. Brown, S.D. Kraus, A.R. Knowlton, P.K. Hamilton, and B.N. White. 1999. Assessment of mitochondrial DNA structuring and nursery use in the North Atlantic right whale (*Eubalaena glacialis*). *Can. J. Zool.* 77:1-6.
- Taylor, B.L. and A.E. Dizon. 1999. First policy then science: why a management unit based solely on genetic criteria cannot work. *Molecular Ecology* 8: S11-S16.
- Waldick, R.C. 1999. Assessing the status of the endangered North Atlantic right whale using genetic and demographic data. Ph.D. thesis, McMaster University. 172 pp.

Table 1: Numbers of right whale calves photographed from Fundy and non-Fundy population. \$=calves which did not die in the calving ground. \*Calves for which photos are inadequate to permit individual identification.

Year	Calves born	Calves alive\$	Fundy calves	Non-Fundy	Unknown calves*
1980	5	5	3	2	3
1981	8	8	7	1	0
1982	12	11	6	5	2
1983	9	9	4	5	2
1984	12	12	11	1	1
1985	11	11	5	6	3
1986	13	13	6	7	2
1987	11	11	7	4	0
1988	8	7	4	3	0
1989	19	16	11	5	1
1990	12	12	9	3	2
1991	17	17	9	8	5
1992	12	12	4	8	4
1993	8	6	4	2	1
1994	8	8	3	5	3
1995	7	7	3	4	4
1996	21	21	14	7	7
1997	19	19	11	8	7
1998	5	5	0	5	3
1999	4	4	0	4	4
Total	221	214	121	93	54

Table 2: Genotyped mother-calf pairs from Fundy and non-Fundy populations

Year	Possible Pairs*	Total Genotyped	Fundy	Non-Fundy
1980	2	0	0	0
1981	8	3	3	0
1982	9	4	2	2
1983	7	2	2	0
1984	11	6	6	0
1985	8	2	1	0
1986	11	5	3	2
1987	11	6	5	1
1988	7	3	3	0
1989	15	11	9	2
1990	10	4	4	0
1991	12	8	8	0
1992	8	7	4	3
1993	5	3	3	0
1994	5	2	1	1
1995	3	2	2	0
1996	14	9	9	0
1997	12	7	7	0
1998	2	2	0	2
1999	0	0	0	0
<b>Total</b>	<b>160</b>	<b>86</b>	<b>72</b>	<b>13</b>

Table 3: Percentage of genotyped cow-calf pairs from Fundy and non-Fundy population

Year	Identified Fundy	Genotyped Fundy	%-Fundy	Identified Non-Fundy	Genotyped Non-Fundy	%-Non-Fundy
1980	2	0	N/A	0	0	N/A
1981	7	3	42.8571	1	0	N/A
1982	6	2	33.3333	3	2	66.66667
1983	4	2	50	3	0	N/A
1984	11	6	54.5455	0	0	N/A
1985	5	1	20	3	0	N/A
1986	6	3	50	5	2	40
1987	7	5	71.4286	4	1	25
1988	4	3	75	3	0	N/A
1989	11	9	81.8182	4	2	50
1990	9	4	44.4444	1	0	N/A
1991	9	8	88.8889	3	0	N/A
1992	4	4	100	4	3	75
1993	4	3	75	1	0	N/A
1994	3	1	33.3333	2	1	50
1995	3	2	66.6667	0	0	N/A
1996	14	9	64.2857	0	0	N/A
1997	11	7	63.6364	1	0	N/A
1998	0	0	N/A	2	2	100
1999	0	0	N/A	0	0	N/A
<b>Total</b>	<b>120</b>	<b>72</b>	<b>60</b>	<b>40</b>	<b>13</b>	<b>32.5</b>