Strictly confidential until after the discussion of the Scientific Committee of the 47th IWC

The 1995 Research Plan for the Japanese Whale Research Program under Special Permit in the Northwestern Part of the North Pacific –Continuation of the Feasibility Study–

The Government of Japan
March 1995

PREFACE

What is planned for 1995 constitutes the continuation of the research during 1994. Since the needs for the research and possible impact of the take on the stock were already discussed at the Scientific Committee of the 46th, Japan considers that there is no need for substantial debate on this feasibility study. This research program is, nevertheless, being circulated among members, purely for the information and for seeking comments to make minor revisions.

INTRODUCTION

It has been suggested that there exist two stocks of Northwestern Pacific minke whales: the Sea of Japan–Yellow Sea–East China Sea stock (J Stock) and the Okhotsk Sea–West Pacific stock (O Stock). At the Working Group on North Pacific Minke Whale Management Trials in the 45th IWC Scientific Committee, it was argued that there is no adequate ground for asserting for the presence of two stocks only, and a working model regarding application of RMP was developed on the assumption that there exist three sub–stocks in J Stock, four sub–stocks in O Stock and another one stock (W Stock) in the central part of the North Pacific. Others responded, however, that there is no ground to support the sub–stock scenario. The Scientific Committee noted the desirability of improvement of information concerning the stock structure to resolve these questions.

The information needed to improve this situation can be summarized in the following three points.

(1) Clarify whether W stock exists

Clarify whether there exists a hypothesized W stock which migrates from the central North Pacific (Sub–area 9) into the Okhotsk Sea (Sub–area 12) and the offshore area on the side of Pacific east coast of Japan (Sub–area 8) without approaching the Japanese coast, regardless of whether there is O stock in other Sub–areas adjacent, or where the eastern boundary for O stock lies (Fig.1).

(2) Clarify the mixing rate of W stock

Clarify the extent to which W stock (if it exists) mixes with O stock in Sub-area 8, 9, and 12 (Fig.1)

(3) Clarify the validity of O sub-stock scenario

With respect to the O stock, clarify whether there is evidence for the site-specific sub-stocks in Sub-areas 7, 8, 11 and 12 respectively, or rather there is a homogeneous O stock which has segregation by sex and age and repeats latitudinal and onshore-offshore migration making northward shift in search of feeding grounds.

The present research program will not cover the three sub-stocks hypothesized in J stock because they range in the waters of Russia, North Korea, the Republic of Korea and China. Implementation of the research in those areas seems to be politically complicated in view of the international situation.

Against this background, the Government of Japan decided in 1994 to launch a 3 to 5 year research program to clarify the stock structure, and submitted a research program to the 45th Annual Meeting of the IWC. The first-year research was conducted from June to September 1994.

This first-year research was the feasibility study to clarify aspects of the first and second objectives (as stated above). It was specifically designed to take 100 animals from Sub-area 9 (Fig.1) from where no samples and data have so far been available, and compare them with the samples and materials accumulated concerning the O Stock in the Japanese coastal waters with a view to identify the number of samples necessary to confirm the presence of the W Stock (if W stock exists in Sub-area 9).

However, due partly to lack of experience in operation in this area, research fleet was affected by a bad weather condition such as heavy fog and unexpected high water temperature. This year's unexpected sea condition was one of the worst case in the past 30 years. There was only low percentage of normal sea conditions during July-September in 1994 -23% in July, 34% in August, 18% in September. As a result, the sampling resulted in a take of 21 animals only (as for details, refer to the Report on Research Cruise in 1994).

Preliminary information of remarkably high value has been obtained from this research, as is reported below. Nevertheless, as is discussed in more detail below, it is felt best not to draw final conclusions at this stage.

For this reason, it has been decided that the 1994 research program will be continued in 1995. The 1995 research programs will follow that of previous year, with a few minor technical changes in research method based on the experience in 1994.

It had been planned previously that research will be launched in 1995 to clarify the presence of sub-stocks in O Stock, another objective of this research. But the implementation of the main research program will be postponed until the completion of the feasibility study.

OUTLINE OF THE PRELIMINARY RESULTS OF FEASIBILITY STUDY IN 1994 AND THE NEED TO CONTINUE IT IN 1995

In the first-year research, data on stock abundance through sighting and various materials and data from 21 animals taken during the research were obtained. Here we will consider about the results of comparisons with O Stock through isozyme and mtDNA analyses as well as morphological characteristics, pollutant, heavy metal, and organochrorine analysis.

(1) Based on isozyme analysis of 21 animals caught during the research, it is considered that these belong to the same breeding group (namely no mixing of more than two separate stocks (see Appendix 1).

(2) Based on the comparative analysis by means of isozyme between the animals taken during the research and the O Stock (i.e. animals obtained from Sub-areas 7 and 11 so far accumulated by the National Research Institute of Far Seas Fisheries), no significant difference was found from O Stock (see Appendix 1).

(3) Similarly, in the comparison through mtDNA with O Stock using RFLP analysis of the D-loop and RFLP analysis of the whole mtDNA, no significant difference was found in both cases between the samples obtained in the previous year's research and the O Stock (see Appendix 2).

(4) One of the three female animals taken had a fetus, and the estimated conception date coincided with the average of that for O Stock (Fujise et al., 1995 in prep). Further, other morphological characteristics presented no difference from the O Stock (Fujise and Kato, 1995 in prep).

(5) The comparative analyses on accumulated pollutants, heavy metal, and organochlorines in the body (blubber, liver,etc.) between the animals taken during the research and the O stock are complicated because the data for the different areas come from whales of different sizes and hence ages; provided that this size difference is taken into account, these data appear compatible with the hypothesis that samples from subarea 9 belong to the O stock. (Fujise, 1995 in prep).

In sum, the animals taken from Sub-area 9 in the 1994 research were found to have the characteristics of the O Stock, suggesting that there exists no W Stock which was assumed by the WG on NP Minke Whale Management Trials, though the statistical power of the tests used is not high because of the small sample size obtained thus far.

The research reported above was planned as a feasibility study aimed at estimating the number of samples necessary to obtain conclusive evidence about the existence or otherwise of the W stock. Although all the results obtained above point towards a single O stock as far east of Japan as Sub-area 9, it must be remembered that the sample size on which this conclusion is based is low, and consists almost entirely of large males.

It is therefore considered best to refrain from drawing final conclusions on the basis of this research alone. Rather the feasibility study is to be completed as originally planned, with

further samples taken over a larger period of the year with the intention of achieving enhanced representation of the female and younger components of the population (if these do in fact migrate to Sub-area 9).

OBJECTIVES OF RESEARCH

The research is aimed to clarify the structure of North Pacific minke whale stocks. Emphasis will be placed on the following points in 1995, the same as for 1994.

1. Clarification whether there exists W Stock

As stated in the foregoing, the first-year research strengthened the plausibility of the conventional hypotheses that there exists no W Stock and that O Stock is distributed throughout Sub-area 9 in the offshore area of the Japanese coast. The 1995 research will be focussed on confirming and consolidating this result by collecting further samples in different year. Most of 21 animals obtained in the 1994 research are composed of mature males, not much of female or immature. Against this background, an expansion of the actual research area in the Sub-area 9 and earlier research season will be set up to attempt to obtain larger samples from these components of the population.

2. Clarify the mixing rate of W and O stocks

Clarify the extent to which W stock (if it exists) mixes with O stock in Sub-area 9.

RESEARCH METHOD AND ITEMS

1. Research method

As aforementioned, only 21 animals were caught in 1994 research, mainly because of bad weather condition and low density of animals. Calculations for 1995 have been based on the data from 1994 research, such as minke whale density, average sighting distance per day and the success rate of take of 50 % of animal found. From these it follows that enhance the possibility of take of the sample in 1995 research, sampling vessel will be increased to 3 vessels from two vessels in 1994 research and expansion of actual research area in Sub-area 9 as well as earlier start of the research than June 30 in the 1994 will be set up.

In addition, as far as the aim of the research is concerned, a rigid random sampling scheme which ignores other information is not essential. Rather some flexibility is desirable for greater efficiency. For this reason, we will change the sampling scheme slightly in 1995.

As in 1994 research, a starting point and direction of cruise line will be set randomly, and, in principle, any minke whales found will be taken. However, based on the experience obtained in the 1994 research, it is deemed to be difficult to fill the initially planned catch number solely through this method. Therefore, it is necessary to implement the research flexibly while giving due consideration to the actual situation, for example, by excluding the area of water temperature where minke whales cannot be expected to be distributed. This area will be set at 15 degree or more based upon the previous survey. But this criterion may be

changed by the actual situation. Alternatively, after a whole area sighting survey, specified research area will be chosen based on the density of animals and other information such as water temperature. Thus research effort will be concentrated to take animals within the specified areas. This is necessary to increase the rate at which animals can be taken so as to meet the goals of the feasibility study.

2. Research items

Same as 1994 research (See Chapter III in Doc. SC/46/NP1).

RESEARCH AREAS AND PERIOD

As same as 1994, the research will be conducted in the expanded area in the Sub-area 9 (Figure 1) from June to September (earlier date of start in 1995 than June 30 in 1994)

NUMBER OF WHALE TO BE SAMPLED AND ITS IMPACT ON THE STOCK

Essentially the same as proposed in 1994, 100 animals will be taken in 1995 and no harmful effect on the stock was estimated (see SC/46/NP1).

RESEARCH VESSELS AND RESEARCH ORGANIZATIONS

Three sighting/sampling vessels and one factory ship (two sampling vessels and one factory ship in 1994) will be used. Research organizations are the same as in 1994.

MATTERS RELATED TO THE "RESOLUTION ON SPECIAL PERMITS FOR SCIENTIFIC RESEARCH"

Same as in the 1994 research. (See Chapter VII in SC/46/NP1).

OTHER MATTERS TO BE CONSIDERED

(1) Analysis of existing samples

Same as in the 1994 research. (See Chapter VIII in SC/46/NP1).

As regards preserved samples, tissue samples of about 1,000 animals were obtained from Sub-areas 7 and 11 combined. But a considerable proportion of those samples had been undergone quality deterioration. Isozyme analysis using these samples have been conducted, resulting in recognition between the J Stock and the O Stock and their mixing (Doc.SC/43/Mi32, Doc.SC/46/NP2).

In 1994, mtDNA analysis was made using these samples and similar results as in Wada (SC/43/Mi32) were obtained concerning J Stock and O Stock. At the same time, comparative studies were made with the 21 animals obtained from Sub-area 9, which did not reveal any difference between O Stock and those 21 animals. In other words, analysis has been

conducted by effectively matching the preserved samples and new samples obtained from research take.

(2) Development of radio tag

Japan established a study team to develop the technology of long-life satellite tag to track the blue whale (SC/Oc93/WP8). This technique will be applied to the research program, when it is developed. However, it will not be used in this year, because these other studies are not sufficiently advanced as yet.

(3) Biopsy sampling

Biopsy sampling was attempted for one minke whale during the previous survey. However, after chasing for a period of 79 minutes, the whale did not come into the shooting range, ending up in failure to collect biopsy samples (See Appendix 1). Nevertheless, during the 1995 survey new attempts will be made in order to obtain biopsy samples from free range minke whale.

REFERENCES

Fujise, 1995, in prep
Differences in accumulation of heavy metals and organochlorines in minke whales sampled in Areas 7 and 9 of the North Pacific.

Fujise et al., 1995, in prep
Cruise report of the Japanese whale research program under a special permit for North Pacific minke whales in 1994.

Fujise and Kato 1995, in prep
Preliminary report of morphol[illegible]nces of minke whales between Areas 7 and 9 of northwestern North Pacific.

SC/43/Mi32 :
Genetic heterogeneity in the Okhotsk Sea-West Pacific Stock of minke whales by S. Wada.

SC/46/NP1 :
Research program for clarification of minke whale stock structure in the northwestern part of the North Pacific by Japanese Government.

SC/46/NP2 :
On the use of allele frequency data to provide estimates of the extent of mixing between the various North Pacific minke whale stocks by A. E. Punt et al.

SC/Oc93/WP8 :
An idea to develop tracking system for migration research of blue whales by Research Institute for Ocean Economics.

APPENDICES

Appendix 1.
Results of the alozyme analysis on 21 minke whale samples from Subarea 9 by S. Wada.

Appendix 2.

Population differentiation in the western North Pacific minke whale as revealed by RFLP analysis of Mitochondrial DNA by M. Goto and L. A. Pastene.

Fig 1

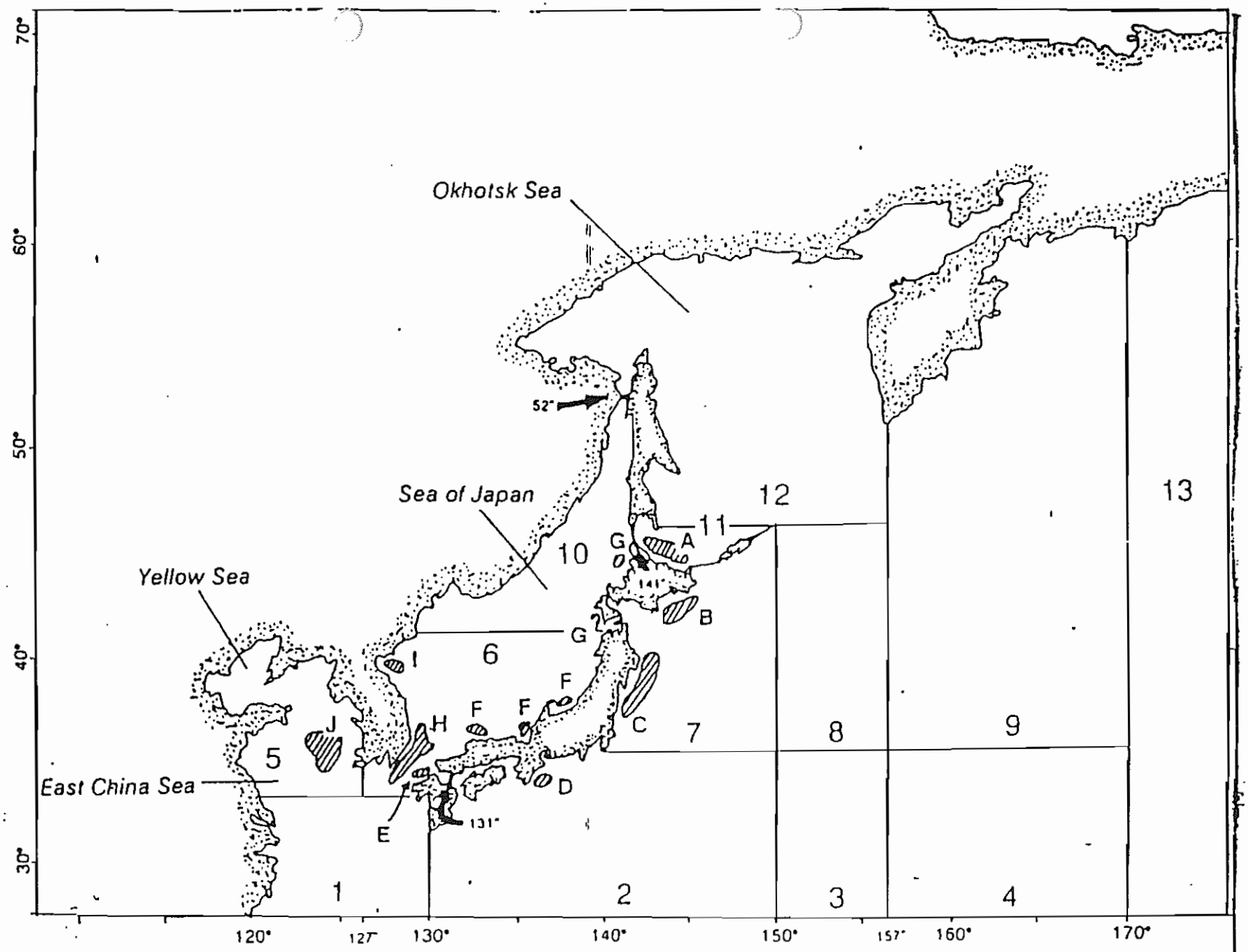


Fig. 1. Map showing location of past Japanese whaling grounds and the 13 sub-areas chosen for the implementation trials (see text).

APPENDIX I

RESULTS OF THE ALLOZYME ANALYSIS ON 21 MINKE WHALE SAMPLES FROM SUBAREA 09

S. Wada

To consider their stock identity, genetic variations at the three loci, Adh-1, Gpi and 6Pgd, were examined on 21 minke whale samples from Subarea 09 taken by the experimental catch in 1994. As already shown in the previous paper (Wada, 1991), these loci are highly diverging and are useful in stock identification of minke whales around Japan. Like in the previous paper, electrophoresis, staining, and naming for loci and alleles followed Wada and Numachi (1991).

At Adh-1, observed genotype distribution was dd=2, dh=9, gh=1 and hh=9 (Table 1), showing a good fit to the Hardy-Weinberg expectations (X^2 =0.01, df=1, p>0.9, excluding a gh whale). At Gpi, only three showed a heterozygous genotype, ab, and the remaining showed bb (Table 2). Although the smallest expectation (0.1 for aa) was less than the disirable value of 1, this locus again showed a good fit to the Hardy-Weinberg expectations (X^2 = 0.13, df=1, 0.5<p<0.75). At 6Pgd, all whales showed a single genotype, ff.

The frequency of the major allele at each locus was calculated from the observed genotype frequencies. They were $Adh\text{-}1^d$=0.31, Gpi^b=0.93 and $6Pgd^f$=1.00 (Table 3). These values were very close to the respective values for O-Stock. The largest difference between Gpi^b= 0.98 for O-Stock and Gpi^b=0.93 for the present sample was insignificant (G=2.48, df=1, 0.1<p<0.25).

In conclusion, there is no reason to consider that the present minke whale samples from Subarea 09 are genetically heterogeneous and that they are taken from a different stock from O-Stock.

Table 1. Observed and expected genotype frequencies at Adh-1. A gh heterozygote was excluded from the test.

Genoytpe	hh	dh	dd	Total
Observed	9	9	2	20
Expected	9.1	8.8	2.1	20.0

X^2 =0.01, df=1, p>0.9

Table 2. Observed and expected genotype freuqencies at *Gpi*.

Genotype	*bb*	*ab*	*aa*	Total
Observed	18	3	0	21
Expected	18.1	2.8	0.1	21.0

X^2 =0.13, df=1, 0.5<p<0.75

Table 3. Comparison of the allele frequency values at the three loci between the present and the previous (Wada, 1991) analyses. Sample 1 = pure sample from J-Stock, Sample 2 = mixed sample of J-Stock and O-Stock, Sample 3 = pure sample from O-Stock, Sample 4 = present sample. n = sample size.

Sample	Region/ (Subarea)	Month	Allele frequency		
			Adh-1[d]	*Gpi*[b]	*6Pgd*[f]
1	H+J(5+6)	9-10	0.93 (n=45)	0.68 (n=42)	0.91 (n=45)
2	A(11)	4	0.71 (n=90)	0.82 (n=30)	0.99 (n=93)
3	A(11) B(7) C(7)	5-9 4-9 4-7	0.32 (n=798)	0.98* (n=597)	>0.99 (n=732)
4	-(9)	7-9	0.31 (n=21)	0.93* (n=21)	1.00 (n=21)

*The difference between the two values was not statistically significant (*G*=2.48, df=1, 0.1<p<0.25).

REFERENCES

Wada, S. and Numachi, K. 1991. Allozyme analyses of genetic differentiation among the populations and species of the *Balaenoptera*. *Rep. int Whal. Commn* (Special issue 13): 125-54.

Wada, S. 1991. Genetic heterogeneity in the Okhotsk sea-west Pacific stock of minke whales. SC/43/Mi32. 17pp.

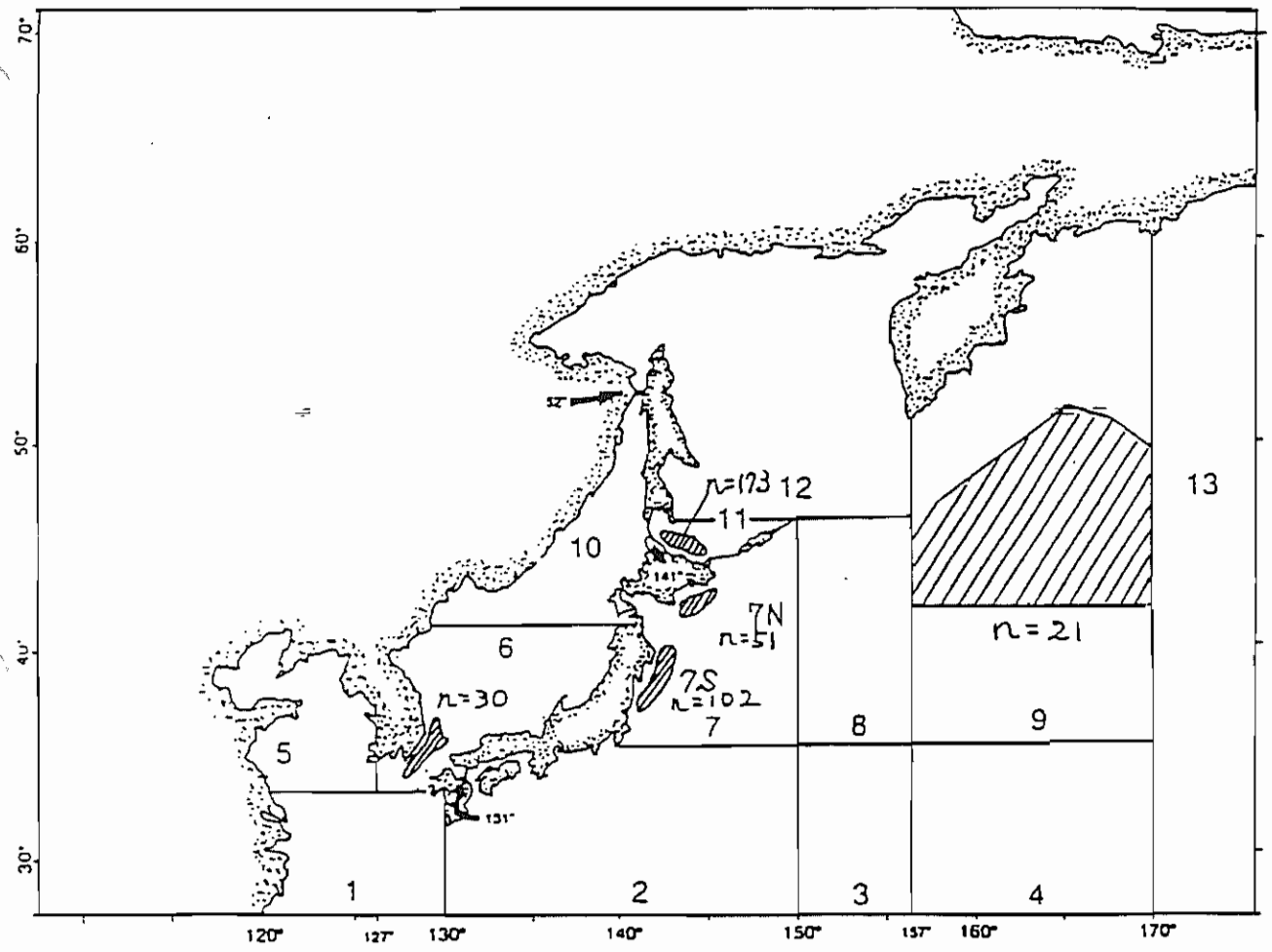
Appendix 2

M. Goto and L.A. Pastene
Ecology Section
ICR

Population Differentiation in the Western North Pacific Minke Whale as Revealed by RFLP Analysis of Mitochondrial DNA

I RFLP analysis of D-loop region of mtDNA

1- Geographical localities examined



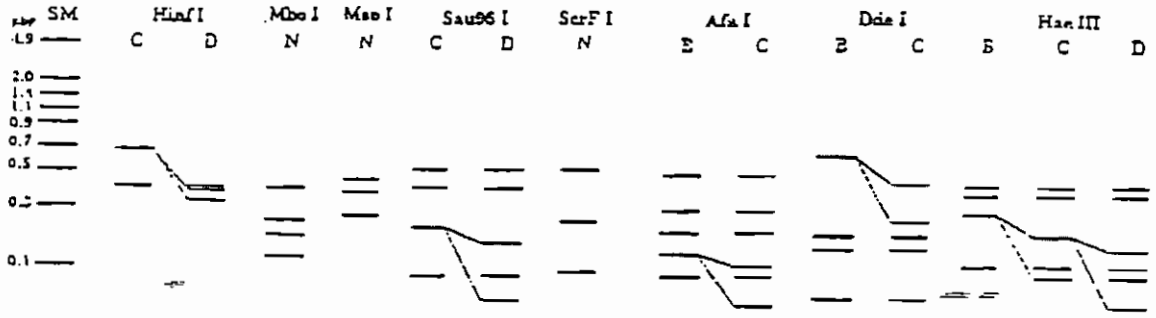
2- Samples examined

Summary of samples examined for mtD-loop DNA RFLP analysis, by locality and month.

Localities	Months							Total
	4	5	6	7	8	9	10	
Area 6	0	0	0	0	0	19	11	30
Area11	57	66	31	5	8	6	0	173
Area7N	0	0	9	14	5	23	0	51
Area7S	44	30	15	11	2	0	0	102
Area 9	0	0	0	8	9	4	0	21

3- RFLP analysis

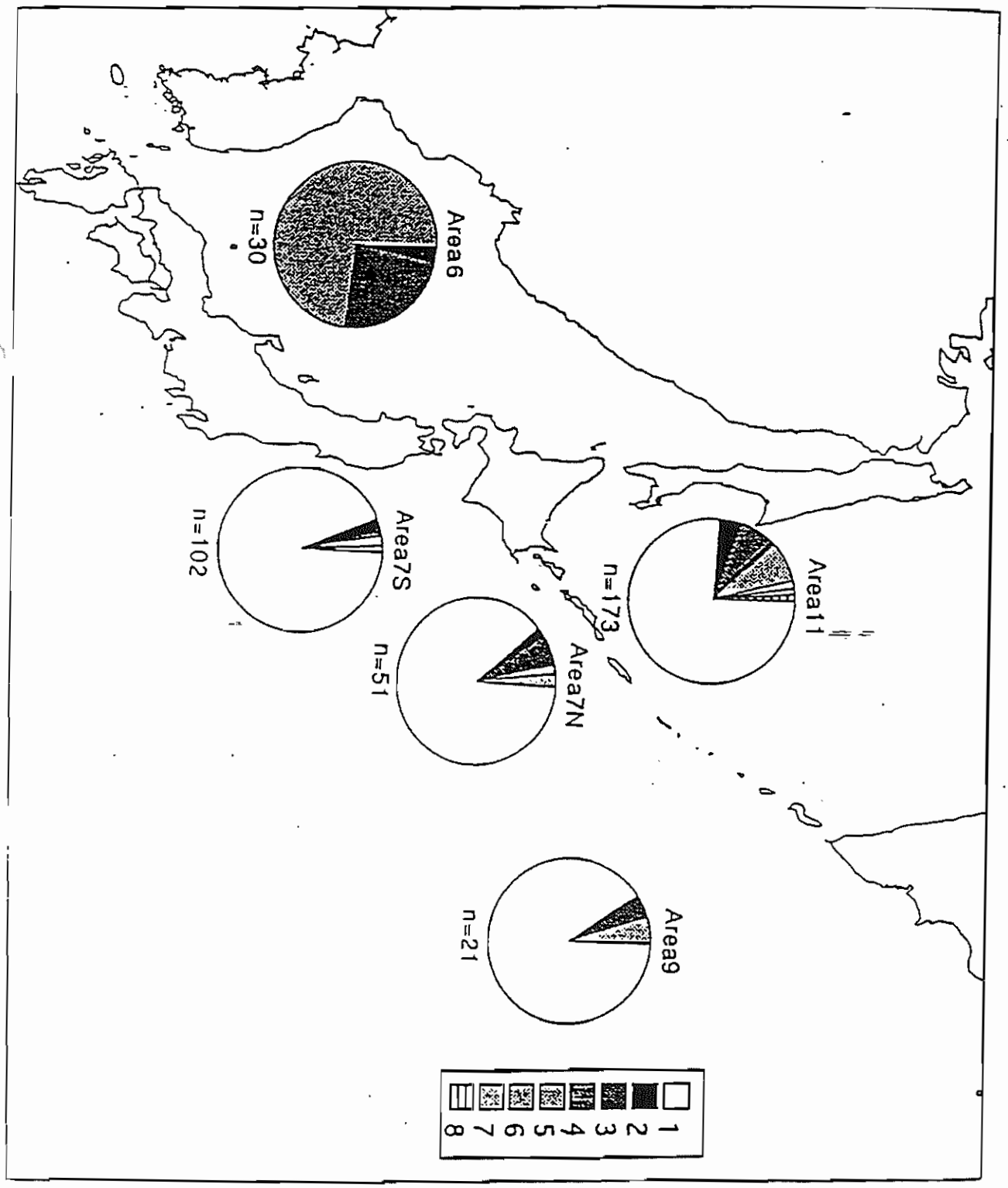
A- Restriction fragment patterns



B- Composite pattern of western North Pacific minke whale haplotypes

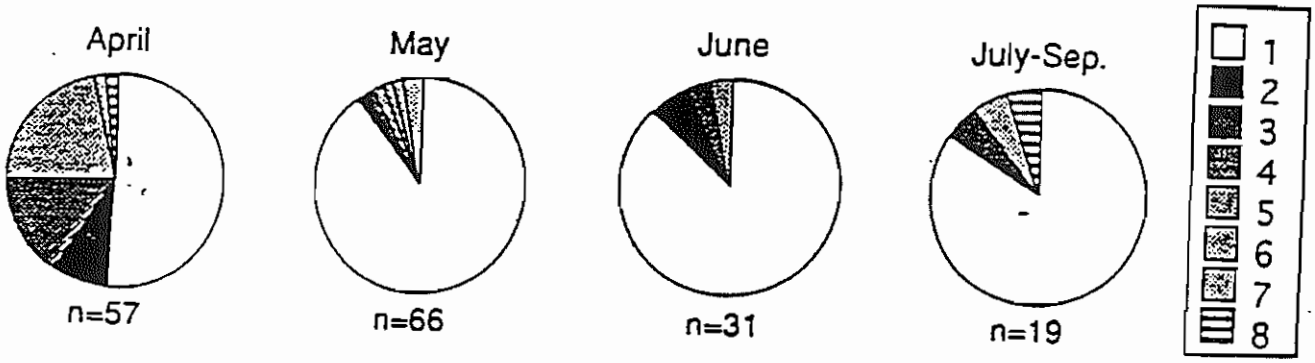
Haplotype	Restriction Enzymes							
	*Afa*I	*Dde*I	*Hae*III	*Hinf*I	*Mbo*I	*Msp*I	*Sau*96I	*Scr*FI
1	C	C	C	C	N	N	C	N
2	B	C	C	C	N	N	C	N
3	C	C	B	C	N	N	C	N
4	C	C	C	C	N	N	D	N
5	B	C	B	C	N	N	C	N
6	C	C	D	C	N	N	D	N
7	C	C	B	B	N	N	C	N
8	C	B	C	C	N	N	C	N

4- Geographical distribution of 8 mtD-loop DNA haplotypes
(See frequencies of these haplotypes by month and locality in Appendix 1)



5- Monthly distribution of 8 mtD-loop DNA haplotypes in Area 11 and Area 7S.

A- Area 11



a) Statistical analysis by the chi-square test of independence

Statistical comparison of haplotype frequencies distribution between months at Area 11 (chi-square analysis with a permutation procedure, 2,000 simulation per test). Figures shown are probabilities.

	April	May	June	July+August+Sept.
April		<0.0005	0.0145	0.0545
May			0.7590	0.3945
June				0.3720

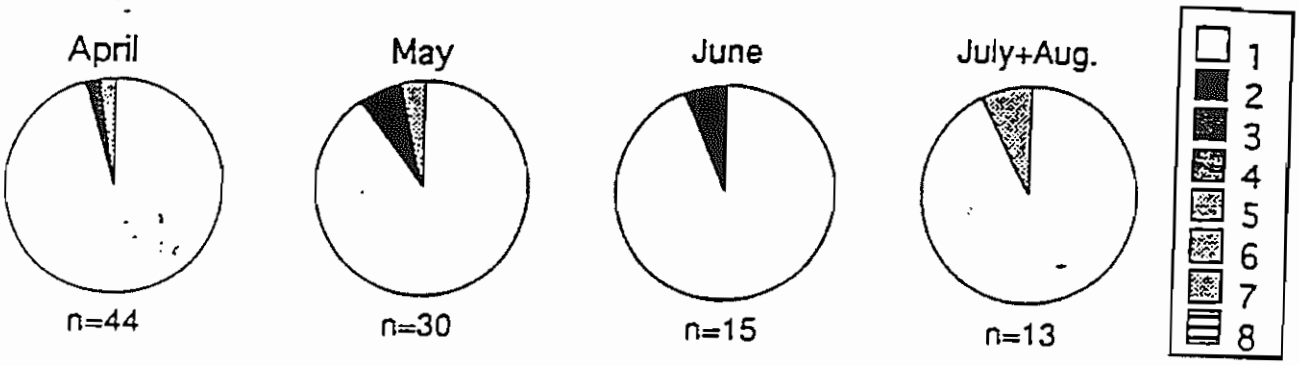
b) Statistical analysis by the Analysis of Molecular Variance (AMOVA)

Variance among months: 14.15%
Variance within months: 85.85%
PHIst: 0.141 (P=<0.0005)

Pairwise comparisons:
Below diagonal= pairwise PHIst values
Above diagonal= probability (2,000 permutations made by test)

	April	May	June	July+Aug.+Sep.
April	0.0000	0.0000	0.0000	0.0000
May	0.1976	0.0000	0.4973	0.7411
June	0.1312	-0.0033	0.0000	0.2649
July+Aug.+Sep.	0.1581	-0.0151	0.0086	0.0000

B- Area7S



a) Statistical analysis by the chi-square test of independence

	April	May	June	July+August
April		0.2685	0.1395	0.1270
May			0.6885	0.1645
June				0.1995

b) Statistical analysis by AMOVA

Variance among months: 1.02%
Variance within months: 98.98%
PHIst: 0.010 (P=0.3348)

Pairwise comparisons:
Below the diagonal: pairwise PHIst values
Above the diagonal: probability (2,000 permutations made by test)

	April	May	June	July+August
April	0.0000	0.1834	0.8481	0.2729
May	0.0181	0.0000	0.4043	0.1644
June	-0.0151	-0.0294	0.0000	0.4328
July+August	0.03328	0.0288	0.0043	0.0000

6- Comparison among areas (April data excluded from Area 11)

A- Analysis by the chi-square test of independence

Chi-square analysis of haplotype frequencies distribution between populations. Figures shown are probabilities.

	Area 6	Area 11	Area 7N	Area 7S	Area 9
Area 6		<0.0005	<0.0005	<0.0005	<0.0005
Area 11			0.9465	0.8120	0.8825
Area 7N				0.4685	0.9100
Area 7S					0.4045

B- Analysis by the AMOVA

Variance among areas: 51.92%
Variance within areas: 48.08%
PHIst: 0.519 (P=<0.0005)

Pairwise comparisons:
Below diagonal: pairwise PHIst values
Above diagonal: probability (2,000 iterations made by test)

	Area 6	Area11	Area7N	Area7S	Area 9
Area 6	0.0000	0.0000	0.0000	0.0000	0.0000
Area11	0.7905	0.0000	0.9545	0.5752	0.8981
Area7N	0.7882	-0.0119	0.0000	0.4148	0.9995
Area7S	0.8496	-0.0029	-0.0029	0.0000	0.5582
Area 9	0.7726	-0.0206	-0.0307	-0.0067	0.0000

7- Intra-populational mtDNA diversity

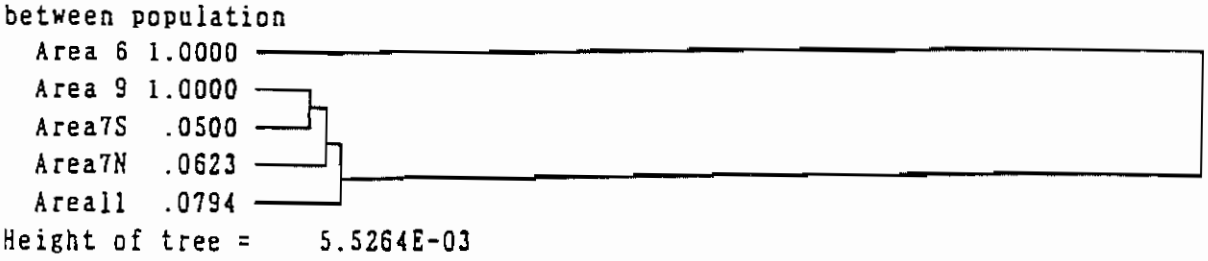
A- Nucleon diversity

Area 6	Area11	Area7N	Area7S	Area 9
0.4207	0.2264	0.2212	0.1324	0.1857

B- Analysis of Nucleotide Diversity

Area 6	Area11	Area7N	Area7S	Area 9
0.000816	0.000618	0.000555	0.000355	0.000501

B- Phylogenetic relationship among areas by UPGMA-based dendrogram, using genetic distance between localities



II RFLP analysis of the whole mtDNA molecule (by Southern hybridization)

1- Samples examined

Summary of samples examined for whole mtDNA RFLP analysis, by locality and month.

Localities	Months						Total
	4	5	6	7	8	9	
Area 11	27	37	7	3	0	1	75
Area 7S	21	13	11	10	0	0	55
Area 9	0	0	0	8	9	4	21
Total	48	50	18	21	9	5	151

2- Geographical and monthly distribution of 14 haplotypes in the western North Pacific minke whale. Letters sequences of haplotypes from right to left are *Acc*I, *Ban*I, *Eco*RV, *Hin*dIII, *Hpa*I, *Pvu*II and *Ssp*I, respectively. The bar indicate the same pattern as haplotype 1

Haplotypes	Area 9				Area 11							Area 7S					Total
Month	7	8	9	T	4	5	6	7	8	9	T	4	5	6	7	T	
1 CCCCCCC	5	6	1	12	12	16	5	2	0	1	36	13	7	4	4	28	76
2 D------	1	1	2	4	1	3	0	0	0	0	4	2	1	1	1	5	13
3 ------E	1	0	0	1	1	8	1	0	0	0	10	4	2	3	1	10	21
4 ---A---	1	0	0	1	1	1	0	0	0	0	2	0	0	0	2	2	5
5 D---D--	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
6 ------A	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	1	2
7 ------D	0	1	0	1	8	5	1	1	0	0	15	0	1	0	2	3	19
8 ---A--D	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1
9 D-----F	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	2
10 D---D-E	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
11 ---B---	0	0	0	0	1	4	0	0	0	0	5	0	1	0	0	1	6
12 D----DF	0	0	0	0	2	0	0	0	0	0	2	0	0	0	0	0	2
13 ------B	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
14 ----B-D	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1
Total	8	9	4	21	27	37	7	3	0	1	75	21	13	11	10	55	151

3- Statistical comparison of haplotype frequencies distribution between localities (Chi-square analysis with a permutation procedure, 2,000 simulation per test). Figures shown are probabilities. In parenthesis are sample size

	Area 9 (21)	Area11 (75)	Area7S (55)
Area 9		0.0460	0.7345
Area11			0.0485

4- Statistical comparison of haplotype frequencies distribution (chi-square test) between loccalities, but April sample data in the Area 11 were excluded for the analysis. Figures shown are probabilities. In parenthesis are sample size

	Area 9 (21)	Area11 (49)	Area7S (55)
Area 9		0.0855	0.7135
Area11			0.4255

III- Suggestions for future analysis

1- We feel that the sample size for Area 9 still small for definitive conclusions at this stage. If possible, the present analysis should be conducted on the basis of more samples from Area 9.

2- The geographical extension of the Pacific population in the Pacific Ocean should be investigated. A preliminary approach could be given by comparing the genetic composition between minke whale samples from both sides of the North Pacific in co-operation with US scientists.

3- In order to conduct mixing ratio estimates of both stocks of the western North Pacific on the basis of haplotype frequencies, yearly variation in mtDNA composition by locality should be investigated, specially for the Okhotsk locality.

Appendix 1: Distribution of mtD-loop DNA haplotypes by locality and month

Area 6

Haplotype ID	September+October
1	0
2	1
3	7
4	0
5	22
6	0
7	0
8	0
Total	30

Area11

Haplotype ID	April	May	June	July	August	Septem.	Total
1	29	59	27	3	7	6	131
2	5	1	2	0	0	0	8
3	9	1	1	1	0	0	12
4	0	1	0	0	0	0	1
5	12	1	1	0	0	0	14
6	1	1	0	0	1	0	3
7	0	2	0	0	0	0	2
8	1	0	0	1	0	0	2
Total	57	66	31	5	8	6	173

Area7N

Haplotype ID	June	July	August	September	Total
1	8	12	5	20	45
2	1	0	0	0	1
3	0	2	0	1	3
4	0	0	0	0	0
5	0	0	0	1	1
6	0	0	0	1	1
7	0	0	0	0	0
8	0	0	0	0	0
Total	9	14	5	23	51

Area7S

Haplotype ID	April	May	June	July	August	Total
1	42	26	14	10	2	95
2	0	2	1	0	0	3
3	1	0	0	0	0	1
4	0	0	0	0	0	0
5	1	1	0	0	0	2
6	0	0	0	1	0	1
7	0	0	0	0	0	0
8	0	0	0	0	0	0
Total	44	30	15	11	2	102

Area 9

Haplotype ID	July	August	September	Total
1	8	8	3	19
2	0	0	0	0
3	0	0	1	1
4	0	0	0	0
5	0	1	0	1
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
Total	8	9	4	21