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論 文

Genetic structure of populations of the green turtle (*Chelonia mydas*) in Japan using mtDNA control region sequences

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Abstract

The green turtle *Chelonia mydas* is distributed throughout tropical and subtropical oceans worldwide. The Japanese population, the northernmost population of this species, is decreasing due to loss of spawning beaches, and peopling to the coastal area. To examine the genetic structure and genetic diversity of the Japanese population, a total of 294 individuals from seven foraging localities and 20 individuals from two nesting sites were analyzed using muscle and skin samples. The control region of mitochondrial DNA (mtDNA) was amplified with specific primers, and 32 haplotypes were detected from the Japanese population. Haplotype diversities (h) of the southern islands (0.89 at Yaeyama and 0.83 at Amami-Ohshima) were higher than those of the main islands (0.69, 0.63, and 0.67 at Nomaike, Muroto, and Owase, respectively). A median-joining tree using the 32 haplotypes showed three clades, and dominant haplotypes were situated in the middle of each clade. The exact test and F_{ST} for geographic heterogeneity in haplotype frequency distributions for the five foraging localities showed that significant differences were detected between Yaeyama and the main island localities, and between the Amami-Ohshima and Nomaike/Owase localities.

Key words: green turtle, *Chelonia mydas*, genetic structure, mitochondrial DNA, control region, Japan.

Introduction

Chelonia mydas, commonly known as the green turtle, is a large sea turtle belonging to the family Cheloniidae (Spotila, 2004). Its common name derives from the green fat found underneath the shell. The range of *Chelonia mydas* extends throughout tropical and subtropical oceans worldwide (Hendrickson, 1958). There are two major subpopulations of the green turtle: the Atlantic (Carr and Carr, 1972; Carr et al., 1978; Formia et al., 2006) and the Eastern Pacific (Chaloupka et al., 2004; Limpus 1997). Each population is genetically distinct, with its own set of nesting and feeding grounds within the population's range. The green turtle's distribution in the Western Pacific is known as far north as Japan and even southern parts of Russia's Pacific coast and as far south as the northern tip of New Zealand and a few islands further south of Tasmania. The turtles also can be found throughout the entire range of the Indian Ocean.

The green turtle that inhabits a region between the western coast of Mexico and the Galapagos Islands is called the black turtle; it has a smaller body size and

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more blackish carapace pigments than other green turtles. The black turtle was classified into an independent species as *Chelonia agassizii* (Bocourt, 1868; Pritchard, 1999). However, genetic and biogeographic studies have supported that the black turtle must be a subspecies of *C. mydas, C. m. agassizii* (Marrquez, 1990; Kamezaki and Matsui, 1995), or belong to the same species as *C. mydas* (Mrosovsky, 1983; Bowen et al., 1993; Dutton et al., 1996; Karl and Bowen, 1999; Chassin-Noria, 2004).

The green turtle was registered as endangered by the IUCN in 2004 (IUCN, 2004), and is listed in Appendix I by the CITES in 2007 (http://www.cites.org/). Many countries have implemented various laws and ordinances to protect individual turtles and turtle nesting areas (Mrosovsky, 1983; Schulz, 1984; Wicaksono, 1992). In Japan, this species was registered as an endangered II (VU) species in 2006 (Ministry of the Environment, 2006).

Green turtles alternate between three habitat types during their life stages. Nesting beaches are where the turtles return to lay eggs. After hatching, turtles in their first five years are known to spend the majority of their early life stage in convergence zones within the open ocean. Mature turtles spend most of their time in coastal, shallow waters with lush seagrass beds. Seagrass meadows within inshore bays, lagoons, and shoals are common locations where adult the green turtle often can be found (Booth and Peters, 1972). One of the first observations to emerge from tagging studies in the 1950s and 1960s was that adult female green turtles return habitually to the same nesting beach, in reproductive cycles of about two to four years (Carr and Ogren, 1960).

Molecular genetic analyses are powerful tools for investigating genetic differentiation among populations, including the genetic structure and the diversity within a population's history (Bowen and Karl, 2007). Molecular analyses of the green turtle have been performed mostly for the Atlantic populations, and some of Pacific populations. The first genetic test of natal homing involved two of the nesting colonies that prompted Archie Carr's original hypothesis of natal homing (Carr, 1967). Meylan et al. (1990) examined female individuals from four nesting rockeries using restriction fragment length polymorphism (RFLP) analysis of mtDNA. Each nesting rockery had a specific genotype, indicating natal homing of the Atlantic green turtle. Also, analyses of mtDNA sequences have demonstrated that individuals from the Surinam rookery possess a haplotype at 100% frequency that is not observed at Ascension Island in the South Atlantic Ocean. Despite extensive overlap in feeding habitats, there are fixed genetic differences (e. g., no sharing of haplotypes) between Surinam and Ascension samples (Bowen et al., 1992).

Although natal homing also has been confirmed in Costa Rica and Florida (Allard et al., 1994) and in the Mediterranean and the Atlantic Ocean (Encalad, 1996), such a clear fixed genetic marker for each rockery has not been defined in the Pacific green turtles (Limpus et al., 1992; Limpus et al., 1994). Nesting areas in the southern Great Barrier Reef, Raine Island, and Capricorn/Bunker have been characterized by mtDNA haplotype composition (Norman et al., 1994; Dethmers et al., 2006), indicating natal homing in West Pacific green turtles and confirming the generality of this reproductive behavior. The green turtle from the Europa Islands and Juan de Nova Island of southern Madagascar had haplotype CM8, which is one of the common haplotypes found in the Atlantic Ocean. It indicates that the green turtle had passed Cape Hope (Bourjea et al., 2007).

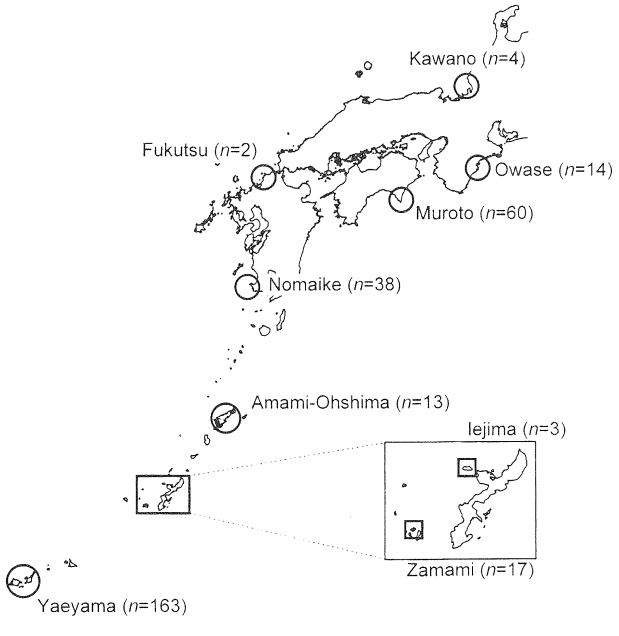

Fig. 1 Sampling localities and number of individuals for nesting and foraging green turtles used in this study. Square area indicates nesting localities, and circles indicate foraging localities.

Many nesting habitats have been identified, but the feeding habitats, where turtles spend the vast majority of their lives, are little studied or unknown. Mixed-stock analyses are now widely employed to resolve sea turtle movements. In addition to the cases described above, mixed-stock analyses have revealed the composition of feeding aggregates in several other species and regions (Bass et al., 1998; Lahanas et al., 1998; Luke et al., 2004; Bass et al., 2006; Naro-Maciel et al., 2007).

In this study, to examine the genetic structure and the genetic diversity of the Japanese population of the green turtle, which are not yet well studied genetically, we analyzed the mtDNA control region, which will provide useful information for conservation of this species.

Materials and Methods

As shown in Fig. 1, a total of 314 individuals (see Appendix) consisted of 20 nesting individuals from Zamami (n=17) and Iejima (n=3), and 294 foraging individuals from Yaeyama (n=163), Amami-Ohshima (n=13), Nomaike (n=38), Muroto (n=60), Owase (n=19), Fukutsu (n=2), and Kawano (n=4).

Muscle and skin samples from tagged and stranded individuals were stored in 99% ethanol. More than 2 mg of the sliced tissue was placed in 310 μl of RSB buffer, 15 μl of 10% SDS, and 15 μl of 20 mg/ml proteinase K and was incubated for 2 hours at 55°C on a rotator for protein digestion. Nucleic acids were extracted using the IsoQuick Nucleic Acid Extraction Kit (ORCA Research Inc., USA).

The complete mtDNA control region was amplified using the primer set L15926.tur (5'-AACCCTAAAGCA TTGGTCTTGTAAACC-3'), designed by Okayama et al. (1999), and 12S-H1.tur (5'-TTTTCACTGGTRTGC WGATACTTGCATGTG-3'), which was designed based on complete mtDNA sequences of *C. mydas* by Kumazawa and Nishida (1999) (Accession No. AB012104). Then, specific internal primers for sequencing were designed: contL2.tur (5'-CGTACATAAYYTGATCTATTCTGGC CTCTGG-3') and contL1.tur (5'-CCTTCCTAGAATA ATCAAAAGAGAAGGAC-3').

PCR for the left domain of the control region was conducted using 12S-H1.tur and TCR6 (5'-GTACGTA CAAGTAAAACTACCGTATGCC-3'), designed by Norman et al. (1994). PCR reactions (25 μl) contained about 50 ng of total DNA, 1 × PCR buffer, 0.2 mM each dNTP mixture, 0.2 mg/ml BSA, 0.2 μ M each primer, and 0.625 units of TaKaRa *Ex Taq* Hot Start Version DNA polymerase (TaKaRa Bio Inc. Ohtsu, Japan). PCR parameters consisted of 30 cycles of denaturation at 94°C for 30 sec, annealing at 58°C for 45 sec, and extension at 72°C for 45 sec.

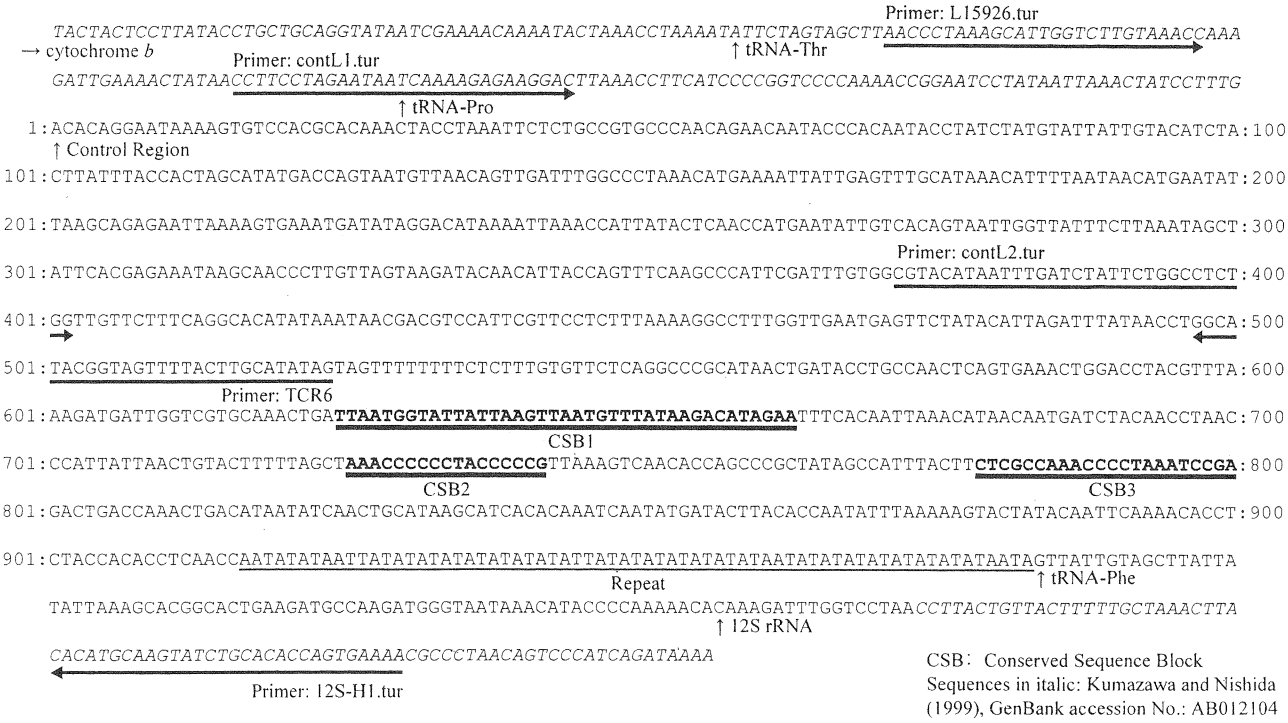

Fig. 2 Complete mtDNA control region sequence and primers used in this study.

Table 1 Haplotypes detected from about 500 bp of the mtDNA control region of 314 green turtle individuals.

	Position from 5' end of the control region																																																							
Haplotypes	10	11	12	31	32	33	34	39	110	162	172	174	176	177	178	185	186	192	193	204	216	235	274	277	300	359	367	368	369	373	375	376	386	387	412	413	414	427	433	434	435	440	449	451	472	473	474	475	476	477	478	479	480	481	482	500	503
CMJ1	T	A	A	–	–	–	–	T	T	G	G	A	T	T	G	–	C	A	A	A	A	A	T	C	A	A	C	A	A	G	G	G	T	C	T	C	C	T	A	C	G	T	C	T	–	–	–	–	–	–	–	–	–	–	A	G	T
CMJ2	•	•	•	–	–	–	–	C	•	•	•	G	•	•	•	–	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	T	•	•	T	•	•	•	•	•	•	•	–	–	–	–	–	–	–	–	–	–	•	•	•
CMJ8	•	•	•	–	–	–	–	•	•	•	•	G	•	•	•	–	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	T	•	•	T	•	•	•	•	•	•	•	–	–	–	–	–	–	–	–	–	–	•	•	•
CMJ14	•	•	•	–	–	–	–	•	C	•	•	G	•	•	•	–	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	T	•	•	T	•	•	•	•	•	•	•	–	–	–	–	–	–	–	–	–	–	•	•	•
CMJ3	•	•	•	–	–	–	–	•	•	•	•	G	•	•	•	–	•	•	•	•	•	•	•	T	•	•	•	•	•	•	•	•	•	T	•	•	T	•	•	•	•	•	•	•	–	–	–	–	–	–	–	–	–	–	•	•	•
CMJ4	•	•	•	–	–	–	–	•	•	•	•	G	•	•	•	–	•	•	•	•	•	•	•	•	•	•	•	G	•	•	•	•	•	T	•	•	T	•	•	•	•	C	•	•	–	–	–	–	–	–	–	–	–	–	•	•	A
CMJ5	•	•	•	–	–	–	–	•	•	•	•	G	•	•	•	–	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	C	T	•	•	T	•	•	•	•	•	•	•	–	–	–	–	–	–	–	–	–	–	•	•	•
CMJ6	•	•	•	–	–	–	–	•	•	•	•	G	•	•	•	–	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	T	•	•	T	•	•	•	•	C	•	•	–	–	–	–	–	–	–	–	–	–	•	•	•
CMJ7	•	•	•	–	–	–	–	•	•	•	•	G	•	•	A	–	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	A	•	T	•	•	T	•	•	•	•	•	•	•	–	–	–	–	–	–	–	–	–	–	•	A	•
CMJ9	•	•	•	–	–	–	–	•	•	•	•	G	•	•	A	–	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	A	•	T	•	•	T	•	•	•	•	•	•	•	–	–	–	–	–	–	–	–	–	–	•	•	•
CMJ10	•	•	•	–	–	–	–	C	•	•	•	•	•	•	•	–	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	T	•	•	T	•	•	•	•	•	•	•	–	–	–	–	–	–	–	–	–	–	C	•	•
CMJ11	•	•	•	–	–	–	–	•	•	•	•	•	•	•	•	–	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	A	•	•	•	•	•	•	•	•	•	•	–	–	–	–	–	–	–	–	–	–	•	•	•
CMJ12	•	•	•	–	–	–	–	•	•	•	•	G	•	•	A	–	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	T	•	•	T	•	•	•	•	•	•	•	C	C	T	T	T	G	G	T	T	G	•	•	•
CMJ13	•	•	•	–	–	–	–	•	•	•	•	•	•	•	•	–	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	T	•	•	T	•	•	•	•	•	•	•	–	–	–	–	–	–	–	–	–	–	•	•	•
CMJ15	•	•	•	T	A	A	C	•	•	A	A	•	•	•	•	A	T	•	•	•	G	•	•	•	•	G	•	•	G	•	•	•	C	T	•	•	T	C	G	•	A	•	•	C	–	–	–	–	–	–	–	–	–	–	•	A	•
CMJ16	•	•	•	T	A	A	C	•	•	A	A	•	•	•	•	A	T	•	•	•	G	•	•	•	•	G	•	•	G	•	•	•	C	T	•	•	T	C	G	T	A	C	•	C	–	–	–	–	–	–	–	–	–	–	•	A	•
CMJ17	•	•	•	T	A	A	C	•	•	A	A	•	•	•	•	A	T	•	•	•	•	•	•	•	•	G	•	•	G	•	•	•	C	T	•	•	T	C	G	T	A	•	•	C	–	–	–	–	–	–	–	–	–	–	•	A	•
CMJ18	•	•	•	T	A	A	C	•	•	A	A	•	•	•	•	A	T	•	•	•	G	•	•	•	•	G	•	•	G	•	•	•	C	T	•	•	T	C	G	T	A	•	•	C	–	–	–	–	–	–	–	–	–	–	•	A	•
CMJ19	•	•	•	T	A	A	C	•	•	A	A	•	•	•	•	A	T	•	•	•	•	•	•	•	•	G	•	•	G	•	•	•	C	T	•	•	T	C	G	•	A	•	•	C	–	–	–	–	–	–	–	–	–	–	•	A	•
CMJ20	•	•	•	T	A	A	C	•	•	A	A	•	•	•	•	A	T	•	•	•	G	G	•	•	•	G	•	•	G	•	•	•	C	T	•	•	T	C	G	T	A	•	•	C	–	–	–	–	–	–	–	–	–	–	•	A	•
CMJ21	•	•	•	T	A	A	T	•	•	•	A	•	•	•	•	A	T	•	•	•	•	•	•	•	•	G	•	•	G	•	•	•	C	T	•	•	T	C	G	•	A	•	•	C	–	–	–	–	–	–	–	–	–	–	•	A	•
CMJ22	•	•	•	T	A	A	C	•	•	A	A	•	•	•	•	A	T	•	•	•	G	•	•	•	•	G	•	•	G	•	•	•	C	T	•	•	T	C	G	T	A	•	•	•	–	–	–	–	–	–	–	–	–	–	•	A	•
CMJ23	•	•	•	T	A	A	C	•	•	A	A	•	•	•	•	A	T	•	G	•	G	•	•	•	•	G	•	•	G	•	•	•	C	T	•	•	T	C	G	T	A	•	•	C	–	–	–	–	–	–	–	–	–	–	•	A	•
CMJ24	•	•	•	T	A	A	C	•	•	•	A	•	•	•	•	A	T	•	•	•	G	•	•	•	•	G	•	•	G	•	•	•	C	T	•	•	T	C	G	T	A	•	•	C	–	–	–	–	–	–	–	–	–	–	•	A	•
CMJ25	–	–	–	T	A	A	C	•	•	•	•	•	C	C	A	–	T	•	•	G	•	•	C	•	G	G	T	•	G	A	A	•	C	•	C	T	T	C	G	T	A	C	•	•	–	–	–	–	–	–	–	–	–	–	•	A	•
CMJ26	–	–	–	T	A	A	C	•	•	•	•	•	C	C	A	–	T	•	•	•	•	•	C	•	G	G	T	•	G	A	A	•	C	•	C	T	T	C	G	T	A	C	T	•	–	–	–	–	–	–	–	–	–	–	•	A	•
CMJ27	–	–	–	T	A	A	C	•	•	•	•	•	•	C	A	–	T	G	•	•	•	•	C	•	G	G	T	•	G	A	A	•	C	•	C	T	T	C	•	T	A	•	•	•	–	–	–	–	–	–	–	–	–	–	•	A	•
CMJ28	–	–	–	T	A	A	C	•	•	•	•	•	C	C	A	–	T	•	•	•	•	•	C	•	G	•	T	•	G	A	A	•	C	•	C	T	T	C	G	T	A	C	•	•	–	–	–	–	–	–	–	–	–	–	•	A	•
CMJ29	–	–	–	T	A	A	C	•	•	•	•	•	C	C	A	–	T	•	G	•	•	•	C	•	G	G	T	•	G	A	A	A	C	•	C	T	T	C	G	T	A	C	•	•	–	–	–	–	–	–	–	–	–	–	•	A	•
CMJ30	–	–	–	T	A	A	C	•	•	•	•	•	C	C	A	–	T	•	•	•	•	•	C	•	G	G	T	•	G	A	A	•	C	•	C	T	T	C	G	T	A	C	•	•	–	–	–	–	–	–	–	–	–	–	•	A	•
CMJ31	–	–	–	T	A	A	C	•	•	•	•	•	C	C	A	–	T	•	G	•	•	•	C	•	G	G	T	•	G	A	A	•	C	•	C	T	T	C	G	T	A	C	•	•	–	–	–	–	–	–	–	–	–	–	•	A	•
CMJ32	–	–	–	T	A	A	C	•	•	•	•	•	C	C	A	–	T	•	•	•	•	•	C	•	G	G	T	•	G	A	A	A	C	•	C	T	T	C	G	T	A	C	T	•	–	–	–	–	–	–	–	–	–	–	•	A	•

Dots indicate identity with the nucleotides of CMJ 1. Dashes indicate deletions or insertions

PCR products were purified by the enzyme method (PCR Product Pre-Sequencing kit; USB Corp., USA), and direct sequencing was undertaken with a Dye Terminator Cycle Sequencing kit (Beckman Coulter Inc., USA), following the manufacturer's protocol. Cycle sequencing consisted of 30 cycles of 96°C for 20 sec, 50°C for 20 sec, 60°C for 150 sec. Capillary sequencing was conducted with a CEQ2000XL DNA sequencer (Beckman Coulter Inc., USA), and detected waves were analyzed using the CEQ Software, Sequence Analysis ver. 2 (Beckman Coulter Inc., USA). Alignment of the sequence data was performed manually using MEGA 3.1 (Kumar et al., 2004).

Genetic variation in populations was expressed as the gene diversity (h; Nei, 1987) estimated from the frequency distribution of haplotypes. Nucleotide diversity (π; Nei, 1987) was estimated from the average number of nucleotide differences per site between two sequences. The population genetic structure was quantified by conventional F-statistics (F_{ST}: Wright, 1951; Weir and Cockerham, 1984) using the program Arlequin ver. 3.11 (Excoffier et al., 2005). The network tree of the haplotypes was constructed by the median-joining (MJ) method (Bandelt et al., 1999) using Network ver. 4.201 (http://www.fluxus-engineering.com)

Results and Discussion

Gene structure of the mtDNA control region

The sequence of the complete mtDNA control region was determined (Fig. 2), and CSB1 (Conserved Sequence Block 1) CSB2, CSB3, and a 70-bp length of a TA repeat were confirmed with sequences presented in Kumazawa and Nishida (1999, GenBank Accession No. AB012104). The insertion of the TA repeat made it difficult to amplify the complete control region. Consequently, we analyzed only about 500 bp around the left domain of the control region between primers contL1.tur and TCR6.

This region had 39 substitutions consisting of 37 transitions, three transversions, and 18 indels (Table 1), defining 32 haplotypes (Accession Nos. AB 472300-AB472331). From the 20 nesting samples (for in details information, see Appendix), four haplotypes, CMJ8, CMJ15, CMJ18, and CMJ25, were identified.

Haplotype frequency

Haplotype frequencies for the green turtle from 2 nesting and 7 foraging localities were shown in Table 2. Among the 32 haplotypes from 314 individuals analysed, haplotype CMJ18 was most dominant and haplotypes CMJ8 and 25 were common.

Genetic diversity

Haplotype diversity (h) and nucleotide diversity (π) for five foraging localities that included more than 10 individuals (Yaeyama, Amami-Ohshima, Nomaike, Muroto, and Owase localities) are shown in Table 3.

Table 2 The observed number of haplotypes for the green turtles from two nesting and seven foraging localites.

	Total	CMJ1	CMJ2	CMJ3	CMJ4	CMJ5	CMJ6	CMJ7	CMJ8	CMJ9	CMJ10	CMJ11	CMJ12	CMJ13	CMJ14	CMJ15	CMJ16	CMJ17	CMJ18	CMJ19	CMJ20	CMJ21	CMJ22	CMJ23	CMJ24	CMJ25	CMJ26	CMJ27	CMJ28	CMJ29	CMJ30	CMJ31	CMJ32
Nesting localitise																																
Zamami	17								1						1			1								14						
Iejima	3																	3														
Foraging localities																																
Yaeyam	163	1	1	2	2	1	2	1	35	16	1	4	6	1	1	4	2	1	26	3	2					26	3	8	1	1	6	6	
Amami-Ohshima	13								2			1			1			1	4							4							
Nomaike	38						2		1	2									21	2	1	1	1			3	1			2		1
Muroto	60		1				5									2			35	2	1			1	1	10				1		1
Owase	14															1			8					1			2	2				
Fukutsu	2																		1	1												
Kawano	4																		2	2												
Total N	314	1	2	2	2	1	9	1	39	18	1	5	6	1	2	8	2	2	101	10	4	1	1	2	1	57	6	10	1	1	9	6	2

Table 3 Haplotype diversity (h) and nuceotide diversity (π) for the five main foraging localities.

	N	Haplotype diversity (h)	Nucleotide diversity (π)
Yaeyama	163	0.87±0.012	0.0332±0.01641
Amami-Ohshima	13	0.83±0.071	0.0336±0.01800
Nomaike	38	0.69±0.082	0.0219±0.01129
Muroto	60	0.63±0.064	0.0205±0.01051
Owase	14	0.67±0.126	0.0190±0.01041

Haplotype diversities (h) of the southern islands (0.89 at Yaeyama and 0.83 at Amami-Ohshima) were higher than those in the main lands (0.69 at Nomaike, 0.63 at Muroto and 0.67 at Owase). Previously described haplotype diversities for foraging populations from North Carolina (Bass et al., 2006), Barbados (Luke et al., 2004), and Almofala (Naro-Meciel et al., 2007) were between 0.7 and 0.8, which were as high as those from the Japanese southern islands. However, foraging populations from Nicaragua (Bass et al., 1998), Bahamas (Lahanas et al., 1998), East-Central Florida (Bass and Witzell, 2000), and Ubatuba (Naro-Meciel et al., 2007) had a wide variation of haplotype diversity (between 0.4 and 0.2). Similarly, the island localities in Japan had higher nucleotide diversity (0.033 at Yaeyama and 0.034 at Amami-Ohshima) than those in the main lands (0.022 to 0.019).

Network tree

A median-joining tree using 32 haplotypes (Fig. 3) indicated three clades: Clade A (haplotypes CMJ1-CMJ14), Clade B (CMJ15-CMJ24), and Clade C (CMJ25-CMJ32). Haplotype CMJ8 was situated at the middle of Clade A, from which 13 haplotypes radiated, differing by one to three substitutions. Haplotype CMJ8 was most dominant, and was also found from nesting individuals from the Zamami locality. In Clade B, nine haplotypes radiated from haplotype CMJ18, differing by one to four substitutions. The most dominant haplotype, CMJ18, was a nesting haplotype from Iejima and was also found from Zamami localities. Clade C consisted of eight haplotypes, radiating by one to five substitutions from haplotype CMJ25, which was also the dominant nesting haplotype from the Zamami locality. These results indicate that the most dominant haplotypes in each clade were the nesting haplotypes that were

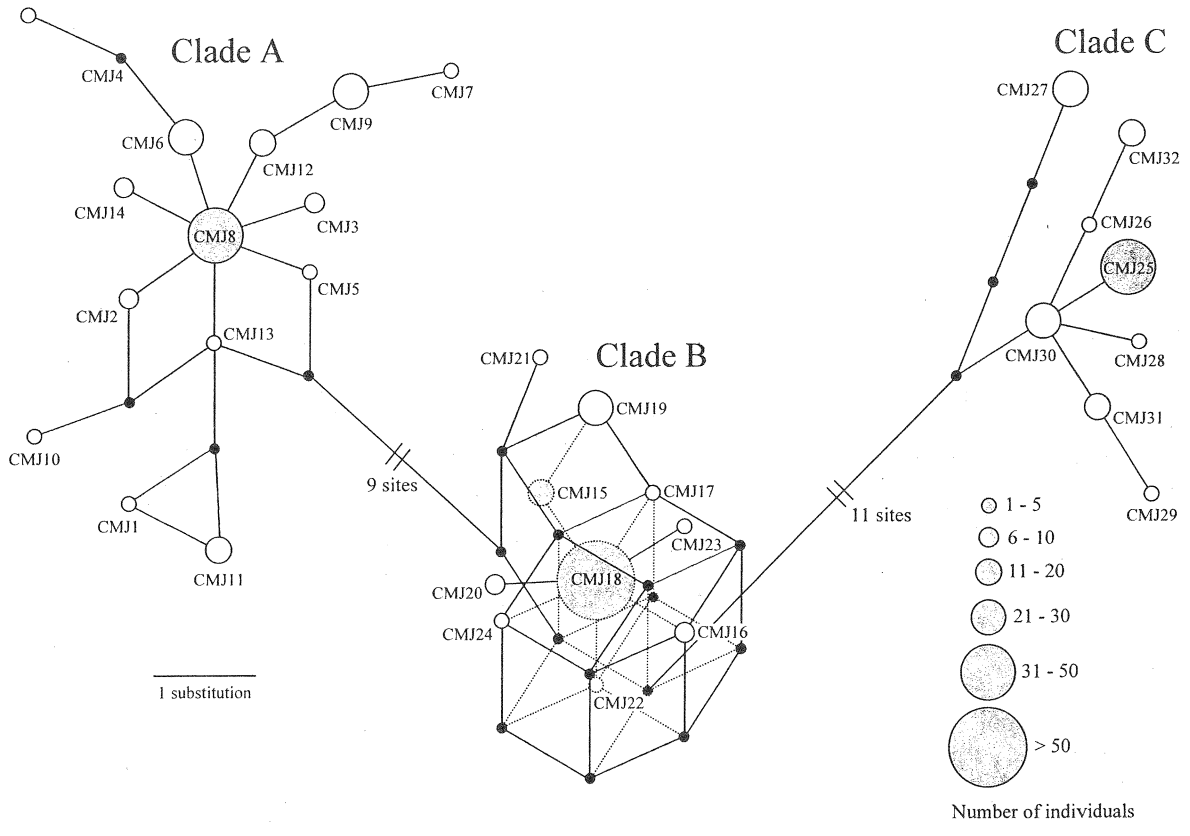

Fig. 3 Median-joining network using the 32 haplotypes detected at 388 bp of this study. Closed circles indicate nesting haplotypes.

produced in the southern islands of Japan.

Genetic differentiation for the five main foraging localities

An exact test and F_{ST} for geographic heterogeneity in haplotype frequency distributions for the five foraging localities are shown in Table 4. In general, F_{ST} ranges from zero, when all subpopulations have equal allele frequencies, to one, when all the subpopulations are fixed for different alleles (Allendorf and Luikart, 2007). Typically, an F_{ST} above 0.15 is considered to be an indication of significant differentiation among fragments (Frankham et al., 2002). Pairwise comparisons showed that significant differences were detected between Yaeyama and main island localities, and between the Amami-Ohshima and Nomaike/Owase localities. No significant differences were detected among the neighboring localities, such as between Yaeyama and Amami-Ohshima, and between Muroto and Owase.

Consequentry, a total of 294 individuals from seven foraging localities and 20 individuals from two nesting sites in the Japanese green turtle population had 32 haplotypes at left domain of the mitochondrial control region. Haplotype diversities (h) of the southern islands were higher (0.89 at Yaeyama and 0.83 at Amami-Ohshima) than those of the main islands (0.69, 0.63, and 0.67 at Nomaike, Muroto, and Owase, respectively).

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Table 4 Genetic differenciation using F_{ST}(lower matrix) and an exact test (upper matrix) for the five main foraging localoties.

	Yaeyama	Amami-Ohshima	Nomaike	Muroto	Owase
Yaeyama	−	0.600±0.0746	0.003±0.0022	0.000±0.0000	0.017±0.0053
Amami-Ohshima	0.00298 (P=0.387)	−	0.092±0.0198	0.018±0.0057	0.010±0.0034
Nonojima	*0.09715 (P=0.000)	*0.05586 (P=0.045)	−	0.383±0.0295	0.184±0.0211
Muroto	*0.12305 (P=0.000)	0.06055 (P=0.054)	−0.00709 (P=0.604)	−	0.022±0.0054
Owashi	*0.11228 (P=0.000)	*0.08864 (P=0.045)	−0.00125 (P=0.423)	0.02023 (P=0.207)	−

Asterisks (*) indicates F_{ST} values with significant differences (significance lebel=0.05).

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Appendix Sample list for the green turtle individuals used in this study.

1 . Nesting individuals from Zamami, Okinawa—offered by Sea Turtle Association of Japan.

Lab. No	Haplotype	Site	Site (in Japanese)	Nesting date	Hatching date	Sampling date
07GTZ1	CMJ25	Chishihama	知志浜	2006.5.31	2006.8.5	2006.8.15
07GTZ2	CMJ25	Machainohama	マチャイノー浜	2006.6.1	2006.8.1	2006.8.24
07GTZ3	CMJ25	Machainohama	マチャイノー浜	2006.6.1	2006.8.1	2006.8.5
07GTZ4	CMJ25	Nitahama	二夕浜	2006.6.5	2006.8.1	2006.7.5
07GTZ5	CMJ15	Kaminogaki	神の垣	2006.6.5	2006.8.1	2006.8.12
07GTZ6	CMJ25	Kaminogaki	神の垣	2006.6.5	2006.8.5	2006.7.14
07GTZ7	CMJ25	Zamanyuhina	ザマンユヒナ	2006.6.6	2006.8.1	2006.8.14
07GTZ8	CMJ25	Nitahama	新田浜	2006.6.8	2006.8.5	2006.8.16
07GTZ9	CMJ25	Kaminogaki	神の垣	2006.6.10	2006.8.15	2006.8.23
07GTZ10	CMJ25	Nitahama	新田浜	2006.6.12	2006.8.10	2006.8.26
07GTZ11	CMJ25	Yuhina	ユヒナ	2006.6.16	2006.8.10	2006.8.21
07GTZ12	CMJ25	Nitahama	新田浜	2006.6.16	2006.8.16	2006.8.29
07GTZ14	CMJ25	Nitahama	新田浜	2006.6.25	2006.8.15	2006.8.29
07GTZ15	CMJ18	Kaminogaki	神の垣	2006.6.25	2006.8.20	2006.7.13
07GTZ17	CMJ25	Kaminogaki	神の垣	2006.7.29	2006.9.25	2006.8.9
07GTZ18	CMJ8	Yakabi	ヤカビ	2006.8.1	2006.9.20	2006.8.13
07GTZ19	CMJ25	Kaminohama	神の浜	—	2000.6.1	—

2 . Nesting individuals from Iejima, Okinawa — offered by Sea Turtle Association of Japan.

Lab. No	Haplotype	Site	Site (in Japanese)	Nesting date	Hatching date	Sampling date
07GTI2	CMJ18	Ie-jima	沖縄県伊江	2006.7.20	—	—
07GTI3	CMJ18	Ie-jima	沖縄県伊江	2006.8.7	—	—
07GTI4	CMJ18	Ie-jima	沖縄県伊江	2006.8.10	—	—

3 . Foraging individuals from Yaeyama during bycatch and tagging experiment — offered by Sea Turtle Association of Japan.

Lab. No	Haplotype	Site	Site (in Japanese)	Sampling date	Sex	SCL (cm)	SCW (cm)	Wt (kg)	Tag No.	Tag No.
06GT1	CMJ4	Ishigaki-Hokusei	石垣北西	1997.9.1	—	70.3	59.4	50.3	J-14688	I-16835
06GT2	CMJ25	Ishigaki-Hokusei	石垣北西	1997.9.1	—	63.6	51.5	34.6	J-14689	I-16836
06GT3	CMJ26	Tarama	多良間	1997.9.1	—	69.7	61.9	45.0	J-14690	I-16837
06GT4	CMJ25	Tarama	多良間	1997.9.1	—	71.2	55.3	49.7	J-14691	I-16838
06GT5	CMJ6	Tarama	多良間	1997.9.1	M	77.2	62.6	59.6	J-14692	I-16839
06GT6	CMJ19	Tarama	多良間	1997.9.1	—	73.8	62.6	59.6	J-14693	I-16840
06GT7	CMJ18	Tarama	多良間	1997.9.1	—	58.4	49.4	26.1	J-14694	I-16841
06GT8	CMJ18	Tarama	多良間	1997.9.1	M	56.8	46.7	25.2	J-14695	I-16842
06GT9	CMJ9	Tarama	多良間	1997.9.1	F	53.2	—	19.6	J-14696	I-16843
06GT10	CMJ26	Tarama	多良間	1997.9.1	F	51.6	42.2	18.6	J-14697	I-16844
06GT11	CMJ9	Tarama	多良間	1997.9.1	M	51.9	43.4	18.0	J-14698	I-16845
06GT12	CMJ16	Tarama	多良間	1997.9.1	F	48.4	41.6	15.6	J-14699	I-16846
06GT13	CMJ18	Tarama	多良間	1997.9.1	F	47.5	38.7	15.2	J-14700	I-16847
06GT14	CMJ18	Tarama	多良間	1997.9.1	F	44.1	36.6	12.1	J-15001	I-16848
06GT15	CMJ30	Iriomote	西表	1997.9.3	M	80.7	63.9	62.2	J-15002	I-16849

Lab. No	Haplotype	Site	Site (in Japanese)	Sampling date	Sex	SCL (cm)	SCW (cm)	Wt (kg)	Tag No.	Tag No.
06GT16	–	Iriomote-Nishi	西表西	1997.9.3	–	75.3	62.4	61.2	J-15003	I-16853
06GT17	CMJ27	Iriomote-Nishi	西表西	1997.9.3	–	70.6	53.9	49.2	J-15004	I-16851
06GT18	CMJ8	Iriomote-Nishi	西表西	1997.9.3	M	83.2	68.7	103.2	J-15005	I-16852
06GT19	CMJ8	Iriomote-Minami	西表南	1997.9.3	F	53.8	44.1	19.4	J-15006	I-16854
06GT20	CMJ3	Iriomote-Minami	西表南	1997.9.3	F	52.0	52.2	18.5	J-15007	I-16855
06GT21	CMJ30	Iriomote-Nishi	西表西	1997.9.3	F	43.9	36.7	9.6	J-15008	I-16856
06GT22	CMJ5	Iriomote-Minami	西表南	1997.9.3	M	42.6	38.7	9.5	J-15009	I-16857
06GT23	CMJ11	Iriomote-Minami	西表南	1997.9.3	F	44.4	39.5	11.0	J-15010	I-16858
06GT24	CMJ8	Ishigaki	石垣	1997.11.4	F	40.2	35.7	8.5	J-15014	I-06862
06GT25	CMJ25	Iriomote-Kita	西表北	1997.11.21	–	67.8	53.0	36.1	J-15020	I-16868
06GT26	CMJ27	Iriomote-Hokusei	西表北東	1997.11.24	F	87.7	66.7	88.0	J-15021	I-16869
06GT27	CMJ8	Kohama-Kita	小浜北	1997.11.24	–	–	–	–	J-15022	–
06GT28	CMJ18	Iriomote-Higashi	西表東	1997.11.21	F	49.8	41.1	15.2	J-15023	I-16871
06GT29	CMJ31	Iriomote-Minami	西表南	1997.11.21	F	40.4	34.2	8.7	J-15024	I-16873
06GT30	CMJ6	Iriomote-Higashi	西表東	1997.1.24	F	50.2	42.2	18.3	J-15025	I-16874
06GT31	CMJ9	Iriomote-Nishi	西表西	1997.11.21	F	40.2	37.1	9.7	J-15026	I-16876
06GT32	CMJ27	Iriomote-Minami	西表南	1997.11.21	F	38.8	31.8	7.2	J-15027	I-16876
06GT33	CMJ19	Iriomote-Nishi	西表西	1997.11.21	M	43.8	37.2	10.8	J-15028	I-16877
06GT34	CMJ8	Iriomote-Nishi	西表西	1997.11.21	M	56.2	46.3	21.3	J-15029	I-16878
06GT35	CMJ25	Iriomote-Minami	西表南	1997.11.21	M	60.2	48.1	29.9	J-15030	I-16879
06GT36	CMJ7	Kabira-Ishizaki	川平石崎	1997.11.28	F	37.9	33.7	7.0	J-15046	I-16883
06GT37	CMJ11	Uganzaki	御神崎	1997.11.28	–	–	56.7	37.6	J-15048	I-16884
06GT38	–	Uganzaki	御神崎	1997.11.28	F	63.2	52.0	34.6	J-15050	I-16885
06GT39	CMJ12	Urasoko	裏底	1997.11.29	F	43.8	38.9	12.4	J-15052	I-16886
06GT40	CMJ8	Kabira-Ishizaki	川平石崎	1997.11.29	M	49.9	41.2	16.1	J-15054	I-16887
06GT41	CMJ8	Urasoko	裏底	1997.11.29	F	39.3	34.4	8.4	J-15056	I-16888
06GT42	CMJ18	Iriomote-Hokusei	西表北東	1997.12.5	–	74.5	58.9	62.0	J-15058	I-16889
06GT43	–	Iriomote-Nishi	西表西	1997.12.4	–	69.3	55.5	47.6	J-15060	I-16890
06GT44	CMJ8	Sakiyama	崎山	1997.12.4	F	53.1	45.2	20.8	J-15062	I-16891
06GT45	CMJ18	Amitori	網取	1997.12.4	M	51.4	44.1	18.4	J-15064	I-16901
06GT46	CMJ18	Amitori	網取	1997.12.4	F	51.4	42.1	19.4	J-15066	I-16903
06GT47	CMJ8	Urauchi	浦内	1997.12.4	F	44.7	39.1	12.9	J-15068	I-16905
06GT48	CMJ18	Urauchi	浦内	1997.12.4	M	51.6	45.5	17.0	J-15070	I-16893
06GT49	CMJ8	Urauchi	浦内	1997.12.4	M	50.1	41.0	17.7	J-15072	I-16907
06GT50	CMJ19	Uehara	上原	1997.12.4	F	50.4	43.5	18.4	J-15074	I-16896
06GT51	CMJ8	Akabanare	赤離	1997.12.4	F	45.0	36.4	11.6	J-15126	I-16898
06GT52	CMJ20	Ishigaki-Kita	石垣北	1997.11.17	F	45.5	37.3	13.5	J-15128	I-16911
06GT53	CMJ8	Ishigaki-Kita	石垣北	1997.12.7	M	64.4	49.2	33.3	J-15132	I-16908
06GT54	CMJ9	Ishigaki-Kita	石垣北	1997.12.7	–	74.6	55.6	60.2	J-15134	I-16900
06GT55	CMJ10	Ishigaki-Kita	石垣北	1997.12.7	F	49.8	40.2	18.1	J-15130	I-16913
06GT56	CMJ11	Ishigaki-Kita	石垣北	1997.12.16	F	81.6	65.6	75.3	J-15140	I-16919
06GT57	CMJ18	Ishigaki-Kita	石垣北	1997.12.16	–	77.3	62.0	60.9	J-15142	I-16921
06GT58	CMJ8	Ishigaki-Kita	石垣西	1997.12.16	–	71.5	57.8	51.1	J-15144	I-16923
06GT59	CMJ8	Ishigaki-Kita	石垣北	1997.12.16	M	63.5	51.6	32.9	J-15146	I-16924
06GT60	CMJ25	Ishigaki-Kita	石垣北	1997.12.16	F	51.8	41.6	17.5	J-15148	I-16926
06GT61	CMJ18	Ishigaki-Nishi	石垣西	1997.12.16	F	47.4	39.6	15.0	J-15150	I-16929
06GT62	CMJ8	Iriomote-Hokutou	西表北東	1997.12.15	M	44.5	38.3	10.5	J-15152	I-16930
06GT63	CMJ25	Ishigaki-Kita	石垣北	1997.12.16	F	50.2	41.4	17.4	J-15154	I-16932
06GT64	CMJ26	Ishigaki-Kita	石垣北	1997.12.16	F	46.1	39.2	15.4	J-15156	I-16934
06GT65	CMJ9	Iriomote-Nishi	西表西	1997.12.20	M	89.3	67.1	103.6	J-15162	I-16940
06GT66	CMJ25	Iriomote-Nishi	西表西	1997.12.20	F	61.0	50.4	31.4	J-15168	I-16946
06GT67	CMJ18	Iriomote-Nishi	西表西	1997.12.20	F	63.5	52.5	35.0	J-15170	I-16948
06GT68	CMJ25	Iriomote-Nishi	西表西	1997.12.19	F	62.3	51.9	31.6	J-15172	I-16950
06GT69	CMJ18	Iriomote-Nishi	西表西	1997.12.20	F	50.0	42.9	18.3	J-15174	I-16952
06GT70	CMJ12	Iriomote-Nishi	西表西	1997.12.20	F	44.3	35.9	10.9	J-15176	I-16954
06GT71	CMJ25	Iriomote-Nishi	西表西	1997.12.20	F	49.9	41.7	16.5	J-15178	I-16956
06GT72	CMJ31	Iriomote-Nishi	西表西	1997.12.20	M	48.3	41.1	14.9	J-15180	I-16958

Lab. No	Haplotype	Site	Site (in Japanese)	Sampling date	Sex	SCL (cm)	SCW (cm)	Wt (kg)	Tag No.	Tag No.
06GT73	CMJ13	Iriomote-Nishi	西表西	1997.12.19	F	40.7	35.4	8.6	J-15182	I-16960
06GT74	CMJ18	Iriomote-Nishi	西表西	1997.12.20	F	44.4	39.3	14.0	J-15184	I-16962
06GT75	CMJ31	Iriomote-Hokusei	西表北西	1997.12.20	F	39.2	33.2	7.8	J-15187	I-16964
06GT76	CMJ12	Ishigaki-Higashi	石垣東	1998.2.5	F	73.4	59.1	48.1	J-15193	I-16971
06GT77	CMJ11	Ishigaki-Higashi	石垣東	1998.12.5	F	67.5	55.5	41.9	J-15195	I-16973
06GT78	CMJ14	Kohama-Kita	小浜北	1998.2.7	M	70.2	55.8	47.25	J-15197	I-16975
06GT79	CMJ9	Ishigaki-Kita	石垣北	1998.2.7	M	63.6	51	31.9	J-15199	I-16977
06GT80	CMJ12	Kuroshima-Nishi	黒島西	1998.6.8	F	47.6	39.5	12.3	J-15238	I-17022
06GT81	CMJ25	Yaeyama	八重山	1997.11.12	–	–	–	–	–	–
06GT82	CMJ18	Iriomote-Hokusei	西表北西	1998.2.18	F	69.6	58.3	43.7	J-15207	I-16985
06GT83	CMJ12	Iriomote-Hokusei	西表北西	1998.12.18	F	80.1	63.7	67.75	J-15209	I-16987
06GT84	CMJ25	Tarama	多良間	1998.3.6	M	70	56	44.45	J-15217	I-16994
06GT85	CMJ8	Tarama	多良間	1998.3.6	F	70.8	57.9	52.15	J-15219	I-16996
06GT86	CMJ20	Hateruma	波照間	1998.3.3	F	36.2	31.4	6.3	J-15221	I-16999
06GT88	CMJ30	Iriomote-Nishi	西表西	1998.8.18	F	52.8	43.9	21	J-15243	I-17033
06GT89	–	Iriomote-Nishi	西表西	1998.8.18	F	51.7	42.1	18.2	J-15245	I-17035
06GT90	CMJ8	Iriomote-Nishi	西表西	1998.8.18	M	50.3	43.1	17.7	J-15247	I-17037
06GT92	CMJ9	Iriomote-Nishi	西表西	1998.8.18	F	43	37.5	10.2	J-15253	I-17043
06GT93	CMJ9	Iriomote-Nishi	西表西	1998.8.18	F	39.6	35.1	8	J-15255	I-17045
06GT94	CMJ27	Hateruma	波照間	1998.8.19	M	70.2	54.7	48	J-15257	I-17052
06GT96	CMJ15	Hateruma	波照間	1998.8.19	M	52	43.5	19.2	J-15261	I-17056
06GT99	–	Hateruma	波照間	1998.8.19	F	72	57.5	50.6	J-15267	I-17062
06GT105	CMJ25	Iriomote-Kita	西表北	1998.8.24	F	48	41.1	16.6	J-15283	I-17078
06GT107	CMJ27	Iriomote-Kita	西表北	1998.8.24	F	77.9	59.2	68	J-15285	I-17082
06GT108	CMJ25	Iriomote-Kita	西表北	1998.8.24	F	79.2	59.3	71	J-15286	I-17083
06GT109	CMJ30	Ishigaki-Kita	石垣北	1998.8.25	–	77.9	62.3	67.8	J-15287	I-17084
06GT110	CMJ1	Ishigaki-Kita	石垣北	1998.8.25	–	63.5	53.2	34.1	J-15288	I-17085
06GT111	CMJ18	Ishigaki-Minami	石垣南	1998.8.23	–	59.9	48.5	32.2	J-15289	I-17086
06GT112	CMJ8	Ishigaki-Minami	石垣南	1998.8.23	M	43.9	37.4	10.9	J-15290	I-17087
06GT113	CMJ9	Ishigaki-Minami	石垣南	1998.8.23	F	50.6	43.2	15.3	J-15291	I-17088
06GT114	CMJ8	Ishigaki-Kita	石垣北	1998.8.25	M	52.7	45.8	17.8	J-15292	I-17089
06GT115	CMJ18	Ishigaki-Kita	石垣北	1998.8.25	M	44.9	36.6	11.6	J-15293	I-17090
06GT116	CMJ9	Ishigaki-Kita	石垣北	1998.8.25	M	47.2	38.3	12.9	J-15294	I-17091
06GT117	CMJ8	Ishigaki-Kita	石垣北	1998.8.25	F	46.1	37.6	11.5	J-15295	I-17092
06GT118	CMJ30	Ishigaki-Kita	石垣北	1998.8.25	M	42.3	36.3	9.5	J-15296	I-17093
06GT119	CMJ18	Tarama	多良間	1998.8.27	M	71.1	54	51	J-15297	I-17094
06GT120	CMJ27	Tarama	多良間	1998.8.27	M	77.3	59.3	52	J-15298	I-17095
06GT121	CMJ25	Tarama	多良間	1998.8.27	F	66.7	54.7	39.8	J-15299	I-17096
06GT122	CMJ25	Tarama	多良間	1998.8.27	M	64	49.7	35.3	J-15300	I-17097
06GT123	CMJ18	Tarama	多良間	1998.8.27	F	51.6	42.8	18	J-18451	I-17098
06GT124	CMJ2	Tarama	多良間	1998.8.27	F	43.6	39	11	J-18452	I-17099
06GT125	CMJ8	Tarama	多良間	1998.8.27	M	48.2	42.3	14.8	J-18453	I-17100
06GT126	CMJ9	Tarama	多良間	1998.8.27	F	47	38.9	13	J-18454	I-17460
06GT127	CMJ12	Tarama	多良間	1998.8.27	F	48.7	40.6	14	J-18455	I-17464
06GT128	CMJ9	Tarama	多良間	1998.8.27	F	51.4	40.3	17.6	J-18456	I-17462
06GT129	CMJ17	Tarama	多良間	1998.8.27	F	51.3	43.3	18.5	J-18457	I-17463
06GT130	CMJ8	Kuroshima-Nishi	黒島西	1999.2.9	M	57.7	48	25.6	J-18463	I-17469
06GT131	CMJ8	Iriomote-Minami	西表南	1999.3.8	M	81.9	61.9	71	J-18468	I-17474
06GT132	CMJ8	Iriomote-Hokusei	西表北西	1999.3.8	F	67.2	55.3	39.2	J-18469	I-17475
06GT133	CMJ3	Iriomote-Kita	西表北	1999.3.8	F	73.7	58.1	53.2	J-18470	I-17476
06GT134	CMJ8	Iriomote-Kita	西表北	1999.3.9	F	43.4	36.4	11.2	J-18471	I-17477
06GT135	CMJ31	Iriomote-Kita	西表北	1999.3.9	F	40.4	36	9.5	J-18472	I-17478
06GT136	CMJ18	Iriomote-Kita	西表北	1999.3.9	M	43.9	38.7	11.9	J-18473	I-17479
06GT137	CMJ8	Iriomote-Kita	西表北	1999.3.9	M	67.7	54	40.2	J-18474	I-17480
06GT138	–	Iriomote-Nishi	西表西	1999.3.8	M	45.7	38.2	11.1	J-18475	I-17481
06GT139	CMJ18	Iriomote-Kita	西表北	1999.3.10	–	74.6	61.7	–	J-18476	I-17482
06GT140	CMJ18	Iriomote-Kita	西表北	1999.3.10	–	69.8	56.8	–	J-18477	I-17483

Lab. No	Haplotype	Site	Site (in Japanese)	Sampling date	Sex	SCL (cm)	SCW (cm)	Wt (kg)	Tag No.	Tag No.
06GT142	CMJ8	Iriomote-Kita	西表北	1999.3.10	F	45.4	38.1	12.9	J-18479	I-17485
06GT143	CMJ18	Iriomote-Kita	西表北	1999.3.10	F	59.2	49.3	27	J-18480	I-17486
06GT144	CMJ8	Kohama-Nishi	小浜西	1999.3.17	M	87.6	69.5	–	J-18484	I-17490
06GT145	CMJ8	Akabanare-Higashi	赤離東	1999.3.17	–	76.1	59.3	–	J-18485	I-17491
06GT146	CMJ9	Kohama-Kita	小浜北	1999.3.19	–	70.1	56.9	–	J-18487	I-17493
06GT147	CMJ25	Kayama-Higashi	カヤマ東	1999.3.19	–	56.7	43.5	–	J-18488	I-17494
06GT148	CMJ8	Kayama-Higashi	カヤマ東	1999.3.19	–	61	47.5	–	J-18489	I-17495
06GT149	CMJ27	Nohara	野原	1999.3.19	–	58.7	48.6	–	J-18490	I-17496
06GT150	CMJ31	Taketomi-Kita	竹富北	1999.3.19	M	42.6	35.1	10	J-19102	I-17498
06GT151	CMJ25	Hirakubo	平久保	1999.3.19	F	46.9	41.8	16.5	J-19103	I-17499
06GT152	CMJ9	Hatoma-kita	鳩間北	1999.3.26	F	79.3	–	–	J-19104	I-17500
06GT153	CMJ25	Iriomote-Kita	西表北	1999.3.26	–	70.6	57.3	–	J-19105	I-19701
06GT154	–	Urauchi	浦内	1999.5.9	F	54.8	5.1	20.5	J-19113	I-19709
06GT155	CMJ25	Amitori	網取	1999.5.9	F	49.3	39.6	16.4	J-19114	I-19710
06GT156	CMJ18	Sakiyama	崎山	1999.5.9	F	42.7	36.6	11.7	J-19115	I-19711
06GT157	CMJ4	Sakiyama	崎山	1999.5.19	M	61.1	50.7	32.2	J-19116	I-19712
06GT158	CMJ16	Sakiyama	崎山	1999.5.9	F	44.3	36.4	14.5	J-19117	I-19713
06GT159	CMJ8	Ochimizuzaki-Nishi	落水西	1999.5.11	–	65.3	52.8	38.4	J-19120	I-197116
06GT160	CMJ18	Ochimizuzaki-Nishi	落水西	1999.5.11	–	–	–	–	J-19121	–
06GT161	CMJ25	Amitori-Kita	網取北	1999.5.11	–	41.9	34.9	9.05	J-19122	I-19718
06GT162	CMJ15	Hateruma	波照間	1999.5.12	–	77.7	63.9	73.8	J-19124	I-19725
06GT163	CMJ25	Hateruma	波照間	1999.5.12	–	64.9	53.1	40.55	J-19125	I-19721
06GT164	CMJ8	Hateruma	波照間	1999.5.12	–	52.9	45	21.5	J-19126	I-19722
06GT165	CMJ25	Hateruma	波照間	1999.5.12	–	40.8	35	9.3	J-19127	I-19723
06GT166	CMJ25	–	–	–	–	–	–	–	J-14606	T-10502
06GT167	CMJ15	–	–	–	–	–	–	–	J-14607	T-10503
06GT168		Nosoko	野底	1997.8.5	F	57	46.8	23.9	J-14613	T-10505
06GT169	CMJ8	Hirakubo	平久保	1997.8.5	F	47.8	40.6	14.95	J-14614	T-10506
06GT170	CMJ30	Hirakubo-Toudai	平久保灯台	1997.8.5	F	45.6	39.7	42.8	J-14615	–
06GT171	CMJ25	Akaishi-minami	明石南	1997.8.5	F	61.1	51	30.2	J-14616	T-10504
06GT172	CMJ28	Shirahama-Sakiyama	白浜～崎山	1997.8.1	M	40.4	35.9	8	J-14626	T-10507
06GT173	CMJ29	Shirahama-Sakiyama	白浜～崎山	1997.8.1	M	42.8	39.2	12.6	J-14628	T-10510
06GT174	CMJ25	Shirahama-Sakiyama	白浜～崎山	1997.8.1	F	54.9	45.7	20.9	J-14629	T-10511
06GT175	CMJ18	Shirahama-Sakiyama	白浜～崎山	1997.8.1	F	59.7	48.6	29.6	J-14630	T-10512
06GT176	CMJ9	Shirahama-Sakiyama	白浜～崎山	1997.8.1	F	54.3	45.7	20.8	J-14631	T-10513
06GT177	CMJ15	Shirahama-Sakiyama	白浜～崎山	1997.8.1	F	49.5	43.7	17.4	J-14632	T-10514
06GT178	CMJ8	Shirahama-Sakiyama	白浜～崎山	1997.8.1	F	48.3	40	13.3	J-14633	T-10516
06GT179	CMJ9	Shirahama-Sakiyama	白浜～崎山	1997.8.1	F	47.9	41	13.5	J-14634	T-10517
06GT180	CMJ8	Ohara	大原	1997.8.12	–	71.2	59.9	49.9	J-14637	T-10521
06GT181	CMJ31	Sakiyama	崎山	1997.8.12	–	71.3	55.7	47.55	J-14638	T-10522
06GT182	CMJ25	Imutazaki	伊武田崎～	1997.8.12	M	41.8	34.8	9.15	J-14640	T-10524
06GT183	CMJ27	Imutazaki	伊武田崎～	1997.8.12	M	59.2	47.6	27.45	J-14642	T-10527

4. Foraging individuals from Amami-Ohshima, Kagoshima during bycatch and tagging experiment — offered by Sea Turtle Association of Japan.

Lab. No	Haplotype	Site	Site (in Japanese)	Sampling date	Sex	SCL (cm)	SCW (cm)	Wt (kg)	Tag No.	Tag No.
07GT39	CMJ14	fixed net	–	–	–	67	53.7	42	20976	–
07GT40	CMJ25	fixed net	–	–	–	65.1	53.4	36	23010	–
07GT41	CMJ18	fixed net	–	–	–	68	53.5	50	–	–
07GT42	CMJ18	fixed net	–	–	–	45.4	35.7	12	20987	–
07GT43	CMJ18	fixed net	–	–	–	71	55	49	20988	–
07GT44	CMJ8	fixed net	–	–	–	74.6	59.1	55	–	–
07GT45	CMJ8	fixed net	–	–	–	46.2	38.5	12	23001	–
07GT46	CMJ18	fixed net	–	–	M	78	64.4	68	23002	–
07GT47	CMJ25	fixed net	–	–	–	41.1	37.2	10	23004	–

Lab. No	Haplotype	Site	Site (in Japanese)	Sampling date	Sex	SCL (cm)	SCW (cm)	Wt (kg)	Tag No.	Tag No.
07GT48	CMJ17	fixed net	–	–	M	83.4	67.1	87	23005	–
07GT49	CMJ25	fixed net	–	–	–	41.6	35	15	23008	–
07GT50	CMJ11	fixed net	–	–	–	65.1	53.4	36	23010	–
07GT51	CMJ25	fixed net	–	–	–	57.4	47	24	23011	–

5 . Foraging individuals from Nomaike, Kagoshima — offered by Miss Yuka Muto, Kagoshima University

Lab. No	Haplotype	Site	Site (in Japanese)	Sampling date	Sex	SCL (cm)	SCW (cm)	Wt (kg)	Tag No.	Tag No.
07GT1	CMJ18	Shirase fixed net	–	2004.6.13	–	47.1	39.4	–	42132	42133
07GT2	CMJ22	Shirase fixed net	–	2004.6.24	–	51.4	43.3	–	42137	42136
07GT3	CMJ32	Shirase fixed net	–	2004.7.02	–	46.4	40.9	–	42140	42141
07GT4	CMJ18	Shirase fixed net	–	2004.7.8	–	75.9	57.9	–	42143	42142
07GT5	CMJ18	Shirase fixed net	–	2004.7.8	–	66.4	51.8	–	42139	42138
07GT6	CMJ18	Shirase fixed net	–	2004.7.19	–	71.4	57.1	–	42144	42145
07GT7	CMJ6	Shirase fixed net	–	2004.7.19	–	75.7	59	–	42146	42147
07GT8	CMJ26	Shirase fixed net	–	2004.7.19	–	78.2	65.3	–	42150	42312
07GT9	CMJ20	Shirase fixed net	–	2004.7.19	–	52.3	43.5	–	42148	42149
07GT10	CMJ18	Shirase fixed net	–	2004.8.01	–	72.3	57.4	–	42321	42320
07GT11	CMJ18	Shirase fixed net	–	2004.8.11	–	67.8	65.2	–	42330	42331
07GT12	CMJ18	Shirase fixed net	–	2004.8.13	–	64.6	52.3	–	42334	42335
07GT13	CMJ19	Shirase fixed net	–	2004.8.13	–	48.8	39.2	–	42336	42337
07GT14	CMJ18	Shirase fixed net	–	2004.8.13	–	49.2	38.8	–	42339	42338
07GT15	CMJ19	Shirase fixed net	–	2004.9.05	–	75	56.1	–	42376	42377
07GT16	CMJ8	Shirase fixed net	–	2004.9.05	–	79	66.3	–	42378	42379
07GT17	CMJ18	Shirase fixed net	–	2004.9.05	–	73.8	56.1	–	42381	42380
07GT18	CMJ9	Shirase fixed net	–	2004.9.05	–	78.7	59.9	–	42384	42383
07GT19	CMJ6	Shirase fixed net	–	2004.9.16	–	73.6	59.3	–	34555	34556
07GT20	CMJ18	Shirase fixed net	–	2004.9.16	F	95.8	71.8	–	34557	34554
07GT21	CMJ21	Shirase fixed net	–	2004.9.20	–	72.3	59.2	–	34562	34566
07GT22	CMJ25	Shirase fixed net	–	2004.9.20	F	90.4	73.4	–	34567	34569
07GT23	CMJ18	Shirase fixed net	–	2004.9.20	–	74.9	59.2	–	34570	34572
07GT24	CMJ18	Shirase fixed net	–	2004.9.20	F	96.7	76.8	–	34573	34574
07GT25	CMJ18	Shirase fixed net	–	2004.9.20	–	72.6	57.9	–	34575	34576
07GT26	CMJ18	Shirase fixed net	–	2004.9.20	–	78.3	61.5	–	34577	34578
07GT27	CMJ18	Shirase fixed net	–	2004.9.20	–	73.9	58.9	–	34580	34579
07GT28	CMJ25	Shirase fixed net	–	2004.9.22	–	72.6	57.2	–	34581	34582
07GT29	CMJ18	Shirase fixed net	–	2004.9.22	F	80	62.9	–	34583	34584
07GT30	CMJ30	Shirase fixed net	–	2004.9.22	F	93.7	74.6	–	34586	34585
07GT31	CMJ18	Shirase fixed net	–	2004.9.23	–	55.5	46.1	–	34587	34592
07GT32	CMJ30	Shirase fixed net	–	2004.10.02	–	60.6	47.4	–	34594	34593
07GT33	CMJ18	Shirase fixed net	–	2004.10.02	M	77	64	–	34595	34596
07GT34	CMJ9	Shirase fixed net	–	2004.10.02	F	76.3	59	–	39907	39908
07GT35	CMJ18	Shirase fixed net	–	2004.10.10	–	69.8	57	–	39927	39928
07GT36	CMJ25	Shirase fixed net	–	2004.11.15	–	40.6	35.1	–	39937	39938
07GT37	CMJ18	Shirase fixed net	–	2004.11.21	–	41.8	36.8	–	39942	39941
07GT38	CMJ18	Shirase fixed net		2004.11.28	F	60.6	47.4	–	39954	39953

6 . Foraging individuals from Muroto, Kouchi during bucatch and tagging experiment — offered by Sea Turtle Association of Japan.

Lab. No	Haplotype	Site	Site (in Japanese)	Sampling date	Sex	SCL (cm)	SCW (cm)	Wt (kg)	Tag No.	Tag No.
07GT76	CMJ18	Mitsu	三津	2004.12.10	–	–	–	–	G020	–
07GT77	CMJ25	Takaoka	高岡	2005.1.13	–	–	–	–	G021	–
07GT78	CMJ6	Mitsu	三津	2005.1.27	–	–	–	–	G022	–
07GT79	CMJ15	Mitsu	三津	2005.1.27	–	–	–	–	G023	–

Lab. No	Haplotype	Site	Site (in Japanese)	Sampling date	Sex	SCL (cm)	SCW (cm)	Wt (kg)	Tag No.	Tag No.
07GT80	CMJ18	Takaoka	高岡	2005.4.15	–	–	–	–	G024	–
07GT81	CMJ18	Mitsu	三津	2005.4.15	–	–	–	–	G025	–
07GT82	CMJ18	Takaoka	高岡	2005.4.15	–	–	–	–	G026	–
07GT83	CMJ25	Shiina	椎名	2005.5.13	–	49.6	42.6	–	44527	44528
07GT84	CMJ20	Takaoka	高岡	2005.5.25	–	46.7	42	15.1	44548	44549
07GT85	CMJ18	Shiina	椎名	2005.6.14	F	70	53.5	51.1	47025	47026
07GT86	CMJ18	Shiina	椎名	2005.6.15	M	94.8	72.4	–	47029	47030
07GT87	CMJ18	Mitsu	三津	2005.6.19	M	94	73.4	–	47051	47052
07GT88	CMJ18	Mitsu	三津	2005.6.19	M ?	97.9	72	–	47055	47056
07GT89	CMJ23	Shiina	椎名	2005.6.21	M ?	75.6	59.9	65	47069	47070
07GT90	CMJ18	Shiina	椎名	2005.6.22	–	48.8	40.5	17.2	47081	–
07GT91	CMJ18	Shiina	椎名	2005.6.22	–	45.3	37.4	14	47082	–
07GT92	CMJ18	Mitsu	三津	2005.6.23	M	85	67.2	84	47093	47094
07GT93	CMJ18	Mitsu	三津	2005.7.29	M	77.2	59	69	44786	44787
07GT94	CMJ18	Shiina	椎名	2005.7.29	M	94.2	71.1	–	44788	44789
07GT95	CMJ18	Shiina	椎名	2005.7.30	–	91.7	71.2	–	44792	44793
07GT96	CMJ19	Shiina	椎名	2005.8.4	M	88.5	70.9	–	44799	44798
07GT97	CMJ18	Shiina	椎名	2005.8.12	F	89.4	71.5	–	44908	44909
07GT98	CMJ25	Takaoka	高岡	2005.9.21	M	91.7	72.4	99.5	39464	39465
07GT99	CMJ18	Mitsu	三津	2005.9.22	F	96.4	76	137	44928	44929
07GT100	CMJ18	Takaoka	高岡	2005.9.23	F	76.4	61.2	61.4	44930	44931
07GT101	CMJ25	Shiina	椎名	2005.9.23	–	78.8	63.7	67.1	44932	44933
07GT102	CMJ6	Mitsu	三津	2005.10.2	F	76.8	61.3	70	44934	44935
07GT103	CMJ18	Takaoka	高岡	2005.10.25	–	44.5	36.9	12.95	–	–
07GT104	CMJ18	Shiina	椎名	2005.10.28	M	92	95	102	44936	44937
07GT105	CMJ25	Mitsu	三津	2005.11.2	F ?	75.7	60.7	58.8	44940	44941
07GT106	CMJ25	Mitsu	三津	2005.11.2	F	105.2	81.2	162	44944	44945
07GT107	CMJ18	Takaoka	高岡	2005.11.4	–	71.3	58.6	–	44946	44948
07GT108	CMJ18	Shiina	椎名	2005.11.4	–	76.1	62.6	67.1	44949	44950
07GT109	CMJ25	Takaoka	高岡	2005.11.23	–	57.7	47.3	28.8	44961	44960
07GT110	CMJ19	Takaoka	高岡	2005.11.22	–	–	–	–	–	–
07GT111	CMJ18	Takaoka	高岡	2006.7.3	-	61.5	49	36.3	47941	47942
07GT112	CMJ15	Shiina	椎名	2006.10.2	M	82.6	65.6	78.4	47971	47972
07GT113	CMJ18	Mitsu	三津	2006.10.23	F	77.4	61.7	71	47981	47982
07GT114	CMJ18	Shiina	椎名	2006.10.23	M	47.5	39.8	18.5	47983	47984
07GT115	CMJ32	Shiina	椎名	2006.11.5	M	41.3	35.5		53101	53102
07GT116	CMJ6	Mitsu	三津	2006.11.15	-	82.4	69.4	82	53109	53110
07GT117	CMJ18	Mitsu	三津	2006.12.5	-	46.2	51.7	18	53131	53132
07GT118	CMJ18	Mitsu	三津	2006.12.12	-	43.9	38.2	11.4	53153	53154
07GT119	CMJ18	Mitsu	三津	2007.6.1	-	40.4	37.2	10.12	53952	53953
07GT120	CMJ25	Mitsu	三津	2007.6.1	-	45.6	40.1	15	53954	53955
07GT121	CMJ18	Shiina	椎名	2007.6.5	-	41.4	36.4	11.1	-	-
07GT122	CMJ18	Takaoka	高岡	2007.6.7	-	51.2	43.3	21	53956	53957
07GT123	CMJ18	Shiina	椎名	2007.6.8	M	95.9	78.5	125	53960	53961
07GT124	CMJ24	Mitsu	三津	2007.6.11	-	48.7	40.6	16	53964	53965
07GT125	CMJ30	Mitsu	三津	2007.6.14	-	45.4	40	14	53966	53967
07GT126	CMJ25	Takaoka	高岡	2007.6.14	-	46.1	38.8	13.7	53970	53971
07GT127	CMJ2	Takaoka	高岡	2007.6.15	M	76.2	59.3	64.8	53972	53973
07GT128	CMJ6	Shiina	椎名	2007.6.17	-	74.6	61.3	62	53976	53977
07GT129	CMJ18	Shiina	椎名	2007.6.17	-	45.7	36.4	-	53978	53979
07GT130	CMJ18	Mitsu	三津	2007.6.18	-	38.3	33	7	53984	53985
07GT131	CMJ18	Mitsu	三津	2007.6.22	M	82.6	62.9	-	53994	53995
07GT132	CMJ18	Mitsu	三津	2007.6.24	M	82.5	62.3	-	54000	57501
07GT133	–	Takaoka	高岡	2007.6.24	M	89.7	73.8	57502	57503	
07GT134	CMJ25	-	-	2005.11.26	F	-	62	73	44918	44919
07GT135	CMJ18	Tokushima-Mugi	徳島牟岐	2005.12.9	-	49.8	39.4	-	-	-
07GT136	CMJ6	Hiwasa	日和佐	2006.8.26	-	45.7	36.8	11	47951	47952

7 . Foraging individuals from Owase, Mie during bycatch and tagging experiment — offered by Sea Turtle Association of Japan.

Lab. No	Haplotype	Site	Site (in Japanese)	Sampling date	Sex	SCL (cm)	SCW (cm)	Wt (kg)	Tag No.	Tag No.
07GT56	–	–	–	2002.5.7	–	–	–	–	24513	24514
07GT57	CMJ18	Haida	早田	2004.6.18	–	–	–	–	42007	42008
07GT58	CMJ18	–	–	2004.7.10	–	–	–	–	42020	42019
07GT59	–	Haida	早田	2004.7.15	–	–	–	–	42021	42022
07GT60	–	Haida	早田	2004.7.15	–	–	–	–	42023	42024
07GT61	CMJ26	Haida	早田	2004.7.16	–	–	–	–	42018	42025
07GT62	CMJ25	Haida	早田	2004.7.18	–	–	–	–	42451	42452
07GT63	CMJ18	Haida	早田	2004.7.20	–	–	–	–	42454	42453
07GT65	CMJ18	Haida	早田	2004.8.6	–	–	–	–	42464	42463
07GT66	–	Haida	早田	2004.8.8	–	–	–	–	42457	42458
07GT67	–	Owase Port	尾鷲漁港	2004.9.21	–	–	–	–	42465	42466
07GT68	CMJ23	Haida	早田	2004.10.26	–	–	–	–	42471	42472
07GT69	CMJ15	Haida	早田	2004.10.26	–	–	–	–	42473	42474
07GT70	CMJ25	Haida	早田	2004.11.26	–	–	–	–	42489	42488
07GT71	CMJ18	Haida	早田	2004.11.23	–	–	–	–	42483	42484
07GT72	CMJ18	Owase Port	尾鷲	2004.12.3	–	–	–	–	42496	42497
07GT73	CMJ18	Haida-Port	早田漁港	2004.12.2	–	–	–	–	–	–
07GT74	CMJ26	Haida	早田	2004.12.6	–	–	–	–	42500	42470
07GT75	CMJ18	Haida	早田	2005.6.6	–	–	–	–	44288	44289

8 . Stranded individuals from Fukutsu, Fukuoka — offered by Fukutsu city

Lab. No	Haplotype	Site	Site (in Japanese)	Sampling date	Sex	SCL (cm)	SCW (cm)	Wt (kg)	Tag No.	Tag No.
07GTF1	CMJ18	Fukuma Beach	福間海岸	2007.9.3	–	41.8	36.2	–	–	–
07GTF2	CMJ19	Fukuma Beach	勝浦海岸	2007.9.6	–	80.8	64.5	–	–	–

9 . Foraging individuals from Kawano, Fukui during bycatch and tagging experiment — offered by Sea Turtle Association of Japan.

Lab. No	Haplotype	Site	Site (in Japanese)	Sampling date	Sex	SCL (cm)	SCW (cm)	Wt (kg)	Tag No.	Tag No.
07GT52	CMJ19	Minamirikuzen-kawano	南陸前町河野	2004.8.27	–	–	–	–	G04082701	–
07GT53	CMJ19	Minamirikuzen-kawano	南陸前町河野	2004.8.27	–	–	–	–	G04082701	–
07GT54	CMJ18	Nibu-Echizen	丹生郡越前町	2005.8.3	–	–	–	–	G050803	–
07GT55	CMJ18	Nibu-Echizen	丹生郡越前町	2005.8.7	–	–	–	–	G050807	–