

Genomic Structure and Phylogenetic Analysis of Luciferase Gene from the Firefly, *Luciola lateralis*

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Objectives

Fireflies, the luminescent insect, have species specific flash patterns, being recognized as sexual communication. The luciferase gene is sole enzyme responsible for bioluminescence. The firefly luciferase gene is widely used as a genetic marker or as a reporter gene in a variety of organism including bacteria, plants and animals. In this study, we illustrate the complete organization of the genomic structure of the luciferase gene from *L. lateralis* sampled in Boun and Muju, Korea.

Materials and Methods

- Insect : *Luciola lateralis*
- DNA Sequencing (Perkin Elmer 310 Genetic Analyzer),
DNA Sequence Alignment (MacVector ver. 6.5)
- Phylogenetic Analysis : PAUP ver. 3.1 (1993)

Results and Discussion

We describe here the complete nucleotide sequence and the exon-intron structure of the luciferase gene of the firefly, *Luciola lateralis*. The luciferase gene of the *L. lateralis* firefly spans 1,971 bp and consisted of six introns and seven exons coding for 548 amino acid residues. From the geographic samples collected at Boun and Muju, Korea, three isoforms, named BU, MJ1 and MJ2, respectively, were obtained. There was no difference in the exon-intron structure among them and MJ1 and MJ2 were identical to those of previously known types from Korean samples.

However, the BU type was novel and differed from MJ1 and MJ2 types by one amino acid, respectively. These luciferase sequences obtained from the Korean samples differed by only 1-2 amino acid residues among them, but these differed from the known, luciferase gene obtained from Japan by 5-6 amino acid residues, suggesting the presence of divergent sequences in this species. Phylogenetic analysis further showed exclusion of the luciferase gene of Japanese *L. lateralis* firefly from the monophyletic group consisted of the Korean *L. lateralis*, suggesting a possible genetic subdivision in this species between the Korean Peninsula and Japan Islands.

Table 1. Pairwise comparisons among amino acid sequences of luciferase genes obtained from this study and known luciferase genes obtained through GenBank search

	1	2	3	4	5	6	7	8	9	10
1. <i>L. lateralis</i> (BU)	-	0.002	0.002	0.011	0.067	0.198	0.194	0.191	0.192	0.486
2. <i>L. lateralis</i> (MJ1, U51019)	1	-	0.004	0.009	0.065	0.196	0.192	0.189	0.191	0.486
3. <i>L. lateralis</i> (MJ2, U49182)	1	2	-	0.009	0.065	0.196	0.192	0.183	0.191	0.485
4. <i>L. lateralis</i> (E05448)	6	5	5	-	0.064	0.191	0.187	0.183	0.185	0.483
5. <i>L. cruciata</i> (M26194)	37	36	36	35	-	0.196	0.196	0.192	0.196	0.470
6. <i>H. unurusana</i> (AF420006)	109	108	108	105	108	-	0.005	0.02	0.033	0.479
7. <i>H. tsushimaana</i> (AF486801)	107	106	106	103	108	3	-	0.018	0.031	0.481
8. <i>H. parvula</i> (L39929)	105	104	104	101	106	11	10	-	0.020	0.479
9. <i>L. mingrelica</i> (S61961)	106	105	105	102	108	18	17	11	-	0.479
10. <i>P. vivianii</i> (AF139644)	268	268	267	266	259	264	264	264	264	-

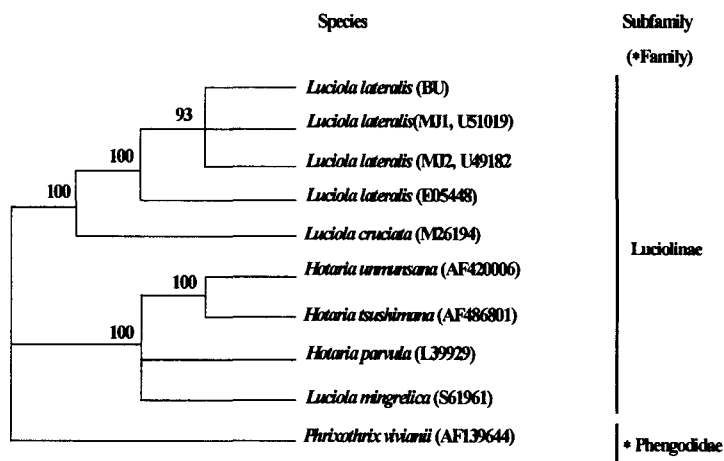


Fig. 1. A phylogenetic tree for aligned amino acid sequences of the *L. lateralis* firefly luciferase and the known Luciolinae luciferases.

References

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