Divergence and polymorphism analysis of IGF1Ra and IGF1Rb from orange-spotted grouper, *Epinephelus coioides* (Hamilton)

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**ABSTRACT.** Orange-spotted grouper (*Epinephelus coioides*) is one of the most important marine fish and has a high market value. The insulin-like growth factor type 1 receptor (IGF1R) is a component of the insulin-like growth factor signaling system, and demonstrates important roles during growth. Based on information from livestock, we used IGF1R as a candidate gene to survey single nucleotide polymorphisms. In the present study, the sequences of IGF1Ra and IGF1Rb from orange-spotted grouper were obtained from the genome sequences and their clustering in clades a and b, respectively, was confirmed by phylogenetic analysis. Fourteen critical amino acids underlying functional divergence were detected between the two clades, revealing the molecular basis of their functional differences. Nearly one-fourth (22 kbp) of the genomic sequence of IGF1Ra was sequenced in a mass cross population, and nucleotide diversity and linkage disequilibrium levels...
were investigated. Nucleotide diversity was 0.00328 for $\pi$ and 0.00344 for $\theta_w$. The half decay of the squared allele-frequency correlation was 10,835 base pairs. Comparatively, the relatively high level of linkage and the significant deviation from neutrality-based codons in IGR1R showed that this gene was under selection. A site (KR269824.1:g. 63762C>T), located in the sixth intron, was significantly associated with eyeball diameter ($P = 1.39 \times 10^{-4}$, Q-value: $2.33 \times 10^{-2}$), which accounted for 11.1% of phenotypic variance. These results highlight the important function of IGF1R in orange-spotted grouper and may be beneficial in the breeding of this species.

**Key words:** IGF1Ra; IGF1Rb; *Epinephelus coioides*; Polymorphism; Nucleotide diversity