



Morphological analysis and muscle-associated gene expression during different muscle growth phases of *Megalobrama amblycephala*

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ABSTRACT. Skeletal muscle growth is regulated by both positive and negative factors, such as myogenic regulatory factors (MRFs) and myostatin (MSTN), and involves both hyperplasia and hypertrophy. In the present study, morphological changes during muscle development in *Megalobrama amblycephala* were characterized and gene expression levels were measured by quantitative real-time polymerase chain reaction (qRT-PCR) analysis in juvenile [60, 90, 120, and 180 days post-hatching (dph)] and adult fish. Our results show that during muscle development, the frequency of muscle fibers with a diameter <20 μm dramatically decreased in both red and white muscles, with a concomitant increase in the frequency of >30 μm fibers in red muscle and >50 μm fibers in

white muscle. At 90-120 dph, the ratio of hyperplastic to hypertrophic areas in red and white muscles increased, but later decreased at 120-180 dph. The effect of hypertrophy was significantly larger than hyperplasia during these phases. qRT-PCR indicated *MRF* and *MSTN* (*MSTNa* and *MSTNb*) genes had similar expression patterns that peaked at 120 dph, with the exception of *MSTNa*. This new information on the molecular regulation of muscle growth and rapid growth phases will be of value to the cultivation of *M. amblycephala*.

Key words: *Megalobrama amblycephala*; Muscle fiber; Gene expression; Morphological analysis; Hyperplasia and hypertrophy